

MTNC030313A1

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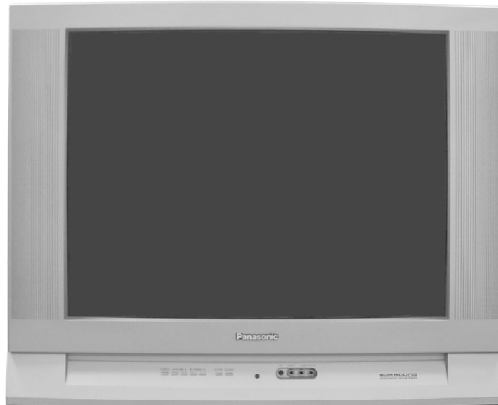
Color Television



**CT-27E13-1G / CT-27E13-1UG / CT-32E13-1G / CT-32E13-1UG
NA8**

This simplified service manual is issued to add listed models to the simplified service manual order No. MTNC000417C1 (CT-27D10B).

service manual oder No. MTNC000417C1(CT-27D10B) .



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Panasonic®

1. Safety Precautions

1.1. General Guidelines

An isolation transformer should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in capacitors, and shields after servicing the receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc. High potentials are present when this receiver is operating. Operation of the receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment. / Extreme care should be practiced when handling the picture tube. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. Discharge the picture tube by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to x-ray radiation. The test picture tube used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against x-ray radiation as well as implosion. The magnetic shield limits the x-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling 50kV without causing x-ray radiation. Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. Do not use a line isolation transformer when testing.

1.2. Leakage Current Cold Check

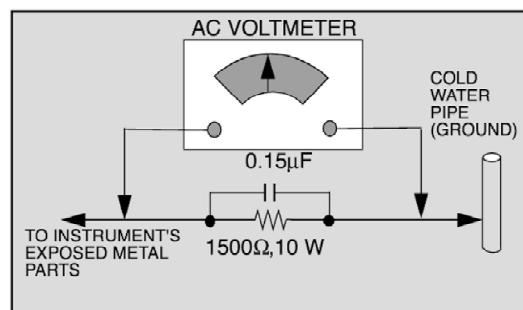
Unplug the AC cord and connect a jumper between the two plug prongs. Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna

terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240k Ω and 5.2M Ω . If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

1.3. Leakage Current Hot Check (Fig. 1)

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check. Connect a 1.5k Ω 10 watt resistor in parallel with a 0.15 μ F capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe. Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor. Repeat the procedure and measure the voltage present with all other exposed metallic parts. Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson model 229, Sencore model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the receiver must be repaired and rechecked before it is returned to the customer.

Fig.1 Leakage Current Hot Check



1.4. X-Ray radiation

CAUTION:

The potential source of x-ray radiation in the TV set is in the high voltage section and the picture tube.

NOTE:

It is important to use an accurate, calibrated high voltage meter.

Set the brightness, picture, sharpness and color controls to minimum. Measure the high voltage. The high voltage should be 28.30kV $\pm$ 1.25kV for 27" models, and 29.25kV $\pm$ 1.25kV for 32" models. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

1.5. Horizontal oscillator disable circuit test

This test must be performed as a final check before the receiver is returned to the customer. See horizontal oscillator disable circuit procedure check in this manual.

2. About Lead Free Solder (PbF)

Note: Lead is listed as (Pb) in the periodic table of elements. / In the information below, Pb will refer to Lead solder, and PbF will refer to Lead Free Solder. / The Lead Free Solder used in our manufacturing process and discussed below is (Sn+Ag+Cu). That is Tin (Sn), Silver (Ag) and (Cu) although other types are available. This model uses Pb Free solder in its manufacture due to

environmental conservation issues. For service and repair work, we'd suggest the use of Pb free solder as well, although Pb solder may be used.

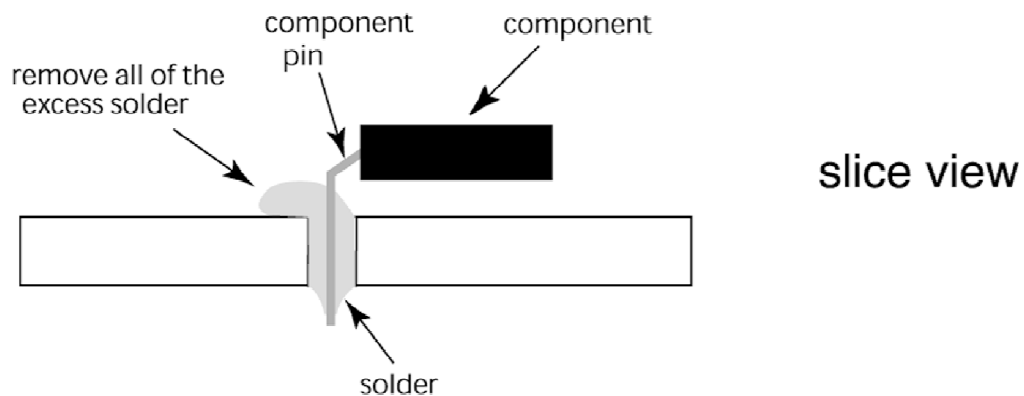
PCBs manufactured using lead free solder will have the "PbF" or a leaf symbol stamped on the back of PCB.



Caution

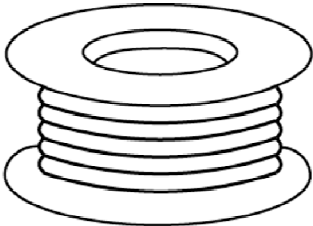
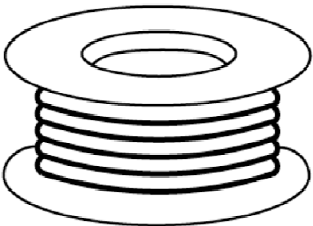
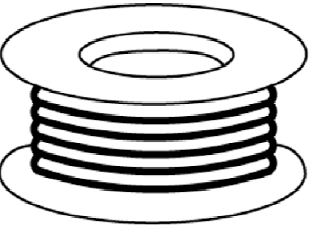
- Pb free solder has a higher melting point than standard solder. Typically the melting point is 50 ~ 70 °F (30 ~ 40 °C) higher. Please use a high temperature soldering iron and set it to 700 ± 20 °F (370 ± 10 °C).
- Pb free solder will tend to splash when heated too high (about 1100 °F or 600 °C). / If you must use Pb solder, please completely remove all of the Pb free solder on the pins or solder area before applying Pb solder. If this is not practical, be sure to heat the Pb free solder until it melts, before applying Pb solder.

After applying PbF solder to double layered boards, please check the component side for excess solder which may flow onto the opposite side. (see figure below).



Suggested Pb free solder

There are several kinds of Pb free solder available for purchase. This product uses Sn+Ag+Cu (tin, silver, copper) solder. However, Sn+Cu (tin, copper), Sn+Zn+Bi (tin, zinc, bismuth) solder can also be used.

0.3mm X 100g	0.6mm X 100g	1.0mm X 100g
		

3. Service Notes

NOTE

These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the IC's when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

3.1. Leadless chip component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chip capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistors have a three digit numerical resistance code, 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6k Ω resistor, 0 = 0 Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

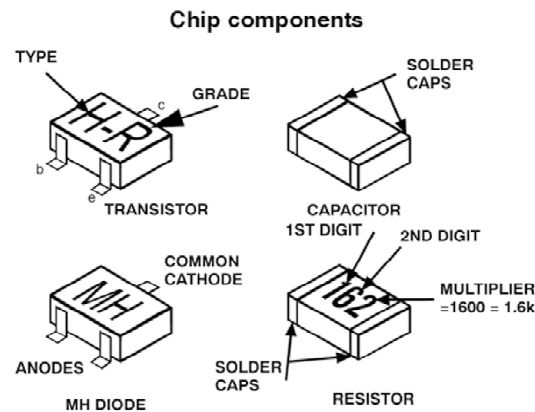
3.2. Component removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

3.3. Chip component installation

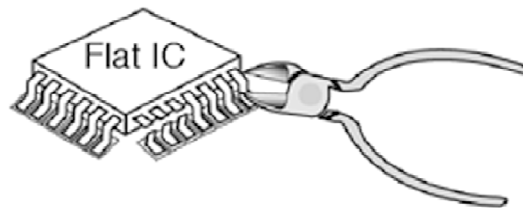
1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with

tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

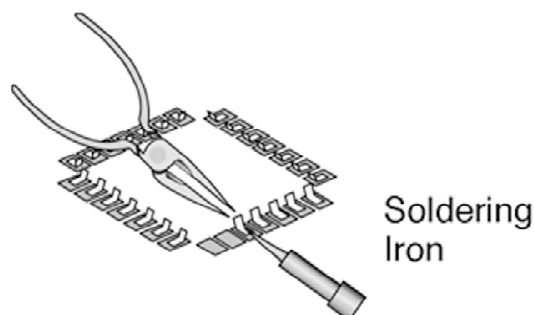


3.4. How to replace Flat IC (required tools)

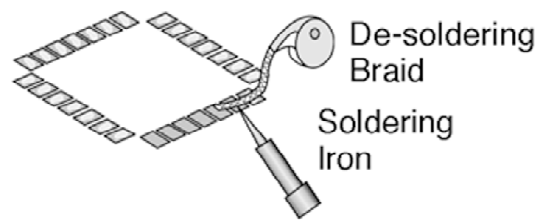
1. Remove the solder from all of the pins of a Flat IC by using a desolder braid.



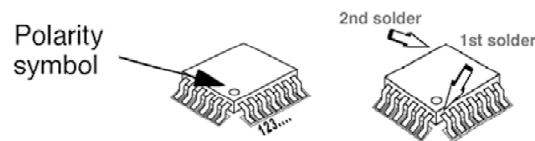
2. Put the iron wire under the pins of the Flat IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.



3. Remove the solder from all the pads of the Flat IC by using a de solder braid.



4. Position the new Flat IC in place (apply the pins of the Flat IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol.



5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de solder braid as shown in the figure below:



IMPORTANT

To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires are securely connected

CAUTION

The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the receiver to avoid damage to the test equipment or to the



chassis. Connect the test equipment to the proper ground(HOT

or COLD ) when servicing, or incorrect voltages will be measured.

WARNING

This receiver has been designed to meet or exceed applicable safety and x ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to x ray radiation and shock and fire hazard, parts indicated with the symbol  on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

3.5. Horizontal Oscillator Disable Circuit

This chassis employs a special circuit to protect against excessive high voltage and beam current. If, for any reason, the high voltage and beam current exceed a predetermined level this protective circuit activates and detunes the horizontal oscillator that limits the high voltage. The over-voltage protection circuit is not adjustable. However, if components indicated by the symbol  on the schematic in either the horizontal sweep system or the over-voltage protection circuit itself are changed, the operation of the circuit should be checked using the following procedure:

Equipment needed to check the disabled circuit:

1. Voltmeter (0 - 200V) scale.
2. High voltage meter (0 - 50kV electrostatic).
3. Variac or isolation transformer.

Procedure:

1. Tune in a station to verify that the horizontal is in sync.
2. Obtain a monoscope pattern or a signal generator crosshatch pattern.

Note: Use cold ground() for negative lead.

3. Connect the voltmeter (-) lead to TPD2 and the (+) lead to TPD1 (junction of D555 anode, R556 & R557). Set bright level to (0) and picture for a 1.8 volt reading on the voltmeter.
 4. Turn the receiver OFF. Connect a jumper across IC803 pin3 and pin 4. Apply +9V DC to cathode of D001.
 5. Reduce the AC supply voltage to approximately 45V. Connect the high voltage meter to the CRT anode. (H.V. button).
- NOTE:**
Use the dag ground (C10 on the CRT Board) to connect the (-) lead of the meter.
6. Turn the receiver ON. Slowly increase the AC supply voltage and verify that for 27" models the high voltages do not exceed 37.1kV, and for the 32" models must not exceed 37.5kV when horizontal just beginstop pull out of sync. If the high voltage is not within the specified limit, the cause must be determined and corrected before the receiver is returned to the customer.

4. Receivers Feature Table

FEATURE MODEL	CT-27E13-1G/UG	CT-32E13-1G/UG
Chassis	SP338	TP341
Number of channels	181	
Menu language	ENG/SPAN/FR	
Closed Caption	X	
V-Chip (USA/CANADA)	X	
Remote model number	EUR7613Z60	
Picture tube	MDDA	
HEC/VEC	HEC	
V/A norm (X=BOTH)	X	
Color temp	X	
Preset/input labeling	X	
Video input memory	X	
MTS/SAP/DBX	X	
BASS/BL/TRE control	X	
AI Sound	X	
Surround	X	
Built-in audio power	5Wx2 (10%)	

Number of speakers	2	
A/V in (rear/front)	3(2/1)	
S-VHS input (rear/front)	1/0	
Component input (Y,Pb, Pr)	1	
Audio Out (FAO:F,VAO:V)	BOTH	
EPJ/HPJ/MISC	HPJ	
Dimensions (WxDxH) mm / in	754.3x534.3x601.6mm 29.69x21.03x23.68in	864.8x543.8x689.5mm 34.04x21.40x27.14in
Weight (kg/lbs)	35.4Kg/78lbs	50Kg/110lbs
Power source (V/Hz)	120V/60Hz A.C.	
Anode voltage	28.30kV $\pm$ 1.25kV	29.25kV $\pm$ 1.25kV

Specifications are subject to change without notice or obligation. Dimensions and weights are approximate.

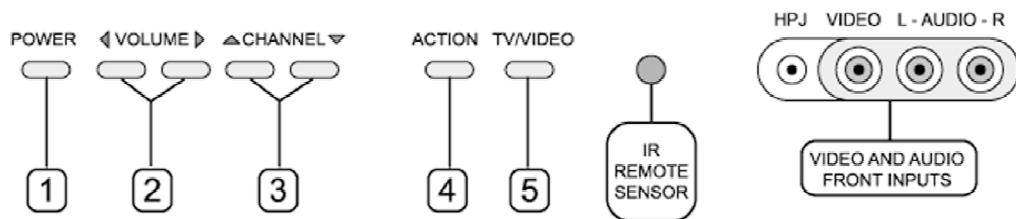
4.1. Board Description

BOARD	CT-27E13-1G/UG	CT-32E13-1G/UG	DESCRIPTION
A-Board TNP2AH017	AK	BL	MAIN CHASSIS
C-Board TNP2AA047	AX	AN	CRT BOARD
Z-Board TNP2AA010	NIL	AE	PINCUSHION CIRCUIT

Note:When ordering a replacement board assembly, append an “S” to the board number. /
Example: To order the A-Board for CT-27E13-1G, the replacement board is TNP2AH017AKS.

5. Location of Controls (Receiver)

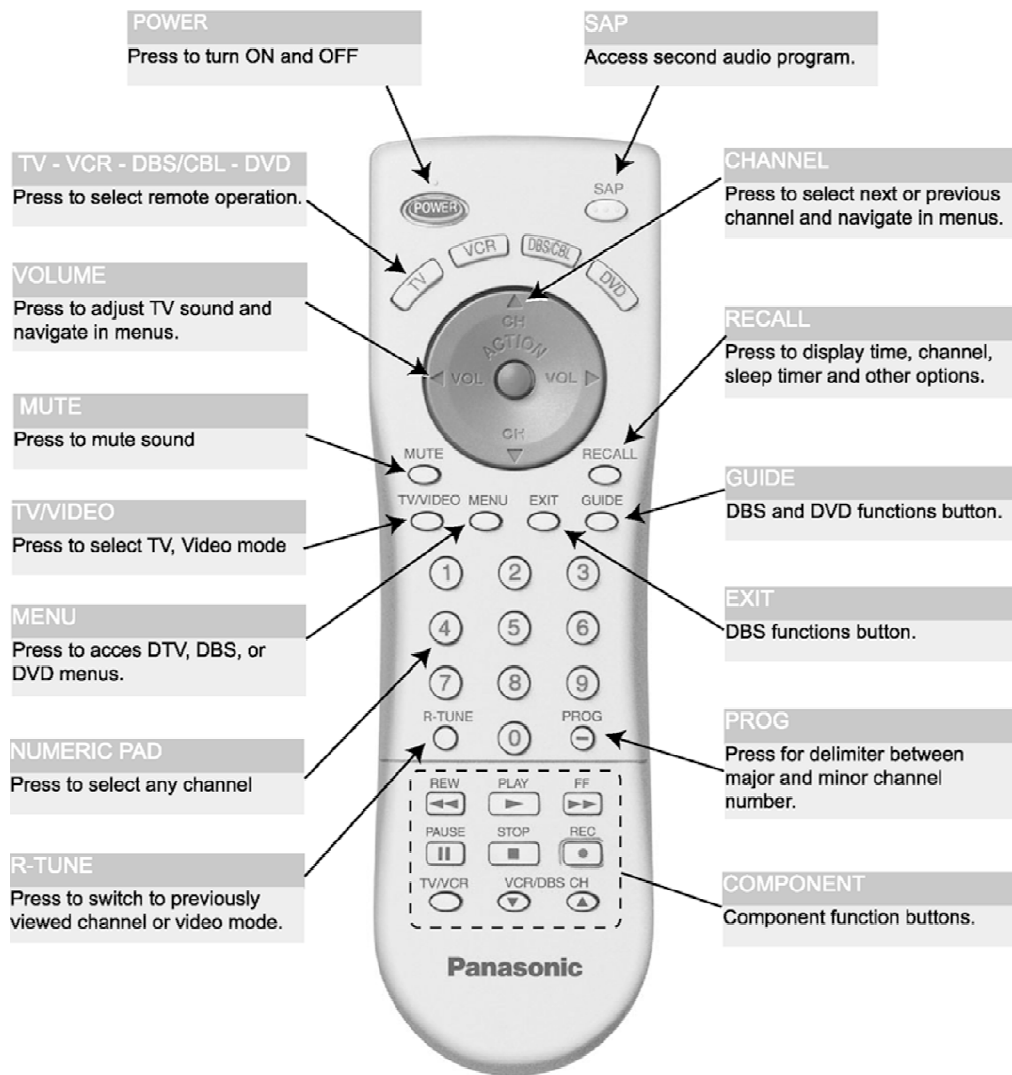
Fig. 2 Location of Controls in the Receiver.



- ① **Power button** - Press to turn ON or OFF.
- ② **Volume buttons** - Press to adjust sound level, or to adjust audio menus, video menus, and select operating features when menus are displayed.
- ③ **Channel buttons** - Press to select programmed channels. Press to highlight desired features when menus are displayed.
- ④ **Action button** - Press to display main menu and access on screen feature and adjustment menus.
- ⑤ **TV/Video button** - Press to select TV or video input.

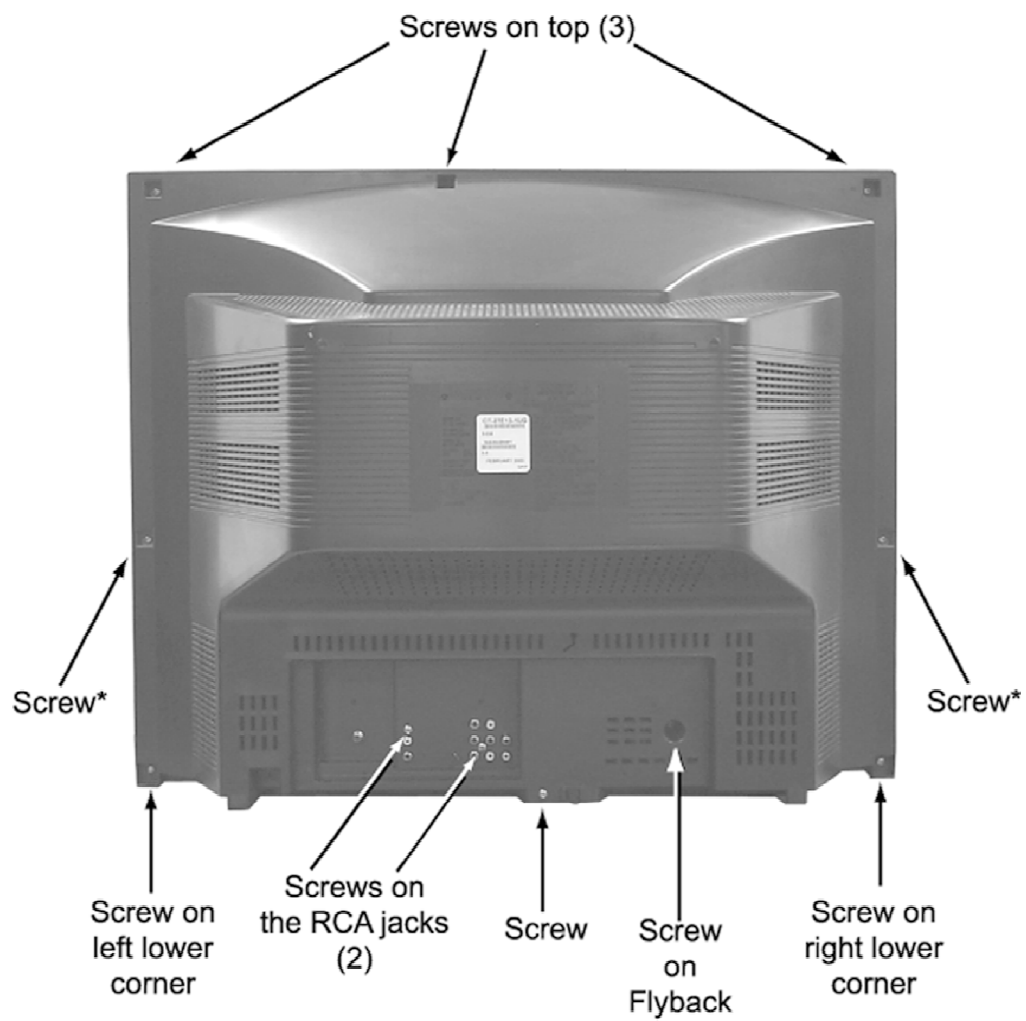
6. Location of Controls (Remote)

Fig.3 Location of controls in remote (EUR7613Z60).



7. Dissassembly for Service (Back Cover)

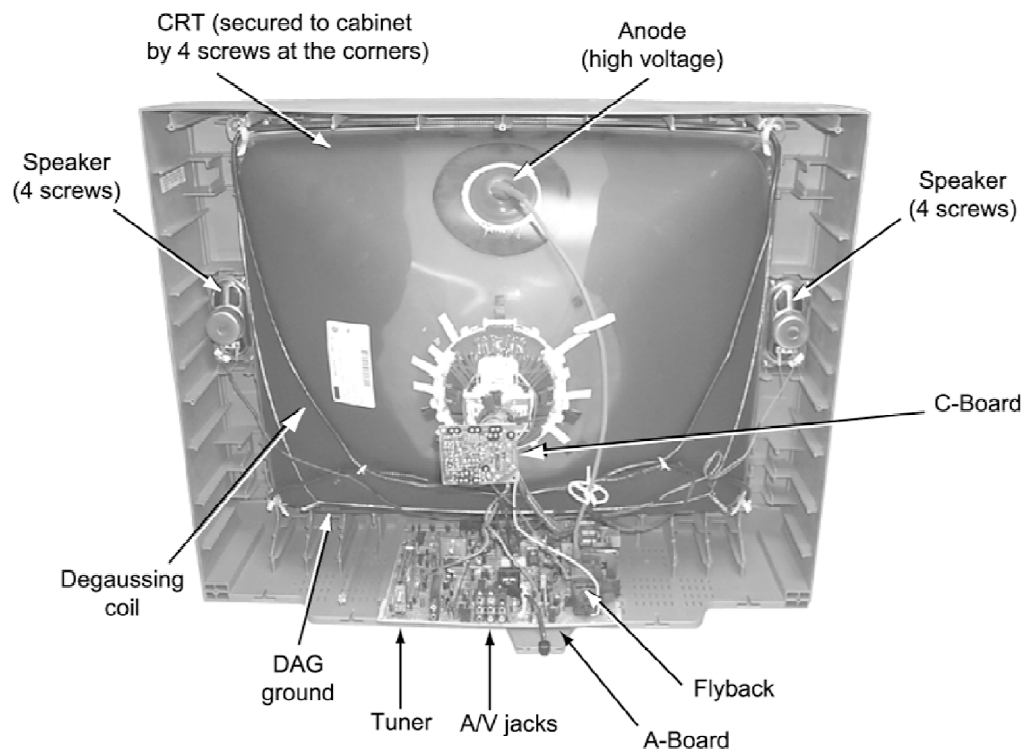
Fig. 4 Back Cover Removal.



** Only in 32" models.*

8. Location of Components

Fig. 5 Location of components.



Note: After servicing the receiver, dress cables and wires as indicated.

9. Replacement Parts List

9.1. Parts List Notes

Important Safety Notice

Components identified by  mark have special characteristics important for safety.
When replacing any of these components, use manufacturer's specified parts.

Abbreviation of part name and description

1. Resistor

Example :

ERD25TJ104 **C** 100K Ω , **J**, 1/4W
Type Allowance

Type	Allowance
C : Carbon	F : $\pm 1\%$
F : Fuse	G : $\pm 2\%$
M : Metal Oxide Metal Film	J : $\pm 5\%$ K : $\pm 10\%$
S : Solid	M : $\pm 20\%$
W : Wire Wound	

2. Capacitor

Example :

ECKF1H103ZF **C** 0.01 μ F, **Z**, 50V
Type Allowance

Type	Allowance
C : Carbon	C : $\pm 0.25\text{pF}$
E : Electrolytic	D : $\pm 0.5\text{pF}$
P : Polyester Polypropylene	F : $\pm 1\text{pF}$ G : $\pm 3\%$
T : Tantalum	J : $\pm 5\%$ K : $\pm 10\%$ L : $\pm 15\%$ M : $\pm 20\%$ P : $\pm 100\%$, -0% Z : $\pm 80\%$, -20%

9.2. Parts List

Ref. No.	Part No.	Part Name & Description	Remarks
CAPRISTORS			
CRA801	TP00842-51	TAPING GAP TERMINAL	
CRA802	TP00842-51	TAPING GAP TERMINAL	
CAPACITORS			
C001	ECA1CM470B	CAP,E 47UF/16V	
C002	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C003	ECA1HM4R7B	CAP,E 4.7UF-50V	
C005	ECA1CM470B	CAP,E 47UF/16V	
C006	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C008	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C009	TCJ2VC1H560J	CAP,C 56PF-J-50V	
C010	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C011	ECA0JM331B	CAP,E 330UF-6.3V / CT-32E13-1G CT-32E13-1UG	
C013	ECA0JM101B	CAP,E 100UF-6.3V	
C016	TCJ2VC1H101J	CAP,C 100PF-J-50V	
C017	TCJ2VC1H270J	CAP,C 27PF-J-50V	
C018	TCJ2VC1H270J	CAP,C 27PF-J-50V	
C020	ECA0JM102B	CAP,E 1000UF-6.3V CT-32E13-1G CT-32E13-1UG	
C020	ECA0JM331B	CAP,E 330UF-6.3V / CT-27E13-1G CT-27E13-1UG	
C021	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C022	ECA1EM471B	CAP,E 470UF-25V	
C024	ECA1HM4R7B	CAP,E 4.7UF-50V	

Ref. No.	Part No.	Part Name & Description	Remarks
C025	ECA1HM010B	CAP,E 1UF-50V	
C026	ECA1HM010B	CAP,E 1UF-50V	
C032	ECA1CM331B	CAP,E 330UF-16V	
C033	TCJ2VC1H680J	CAP,C 68PF-J-50V	
C034	TCJ2VC1H680J	CAP,C 68PF-J-50V	
C043	ECA1HM2R2B	CAP,E 2.2UF-50V	
C044	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C047	ECA0JM102B	CAP,E 1000UF-6.3V	
C048	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C201	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C224	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C225	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C226	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C301	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C302	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C303	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C310	TCJ2VC1H390J	CAP,C 39PF-J-50V	
C315	EEANA1E1R0B	CAP,E 1.0UF-25V	
C320	TCJ2VF1H104Z	CAP,C .1UF-Z-50V	
C321	TCJ2VB1H103K	CAP,C .01UF-K-50V	
C322	TCJ2VB1H103K	CAP,C .01UF-K-50V	
C323	TCJ2VB1H103K	CAP,C .01UF-K-50V	
C324	TCJ2VF1H104Z	CAP,C .1UF-Z-50V	
C330	ECA1AM101B	CAP,E 100UF-10V	
C331	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C337	ECA1HM2R2B	CAP,E 2.2UF-50V	
C342	ECA1HM010B	CAP,E 1UF-50V	
C351	TACCW331T50V	CAP,C 330PF/50V	
C352	TACCW331T50V	CAP,C 330PF/50V	
C353	TACCW331T50V	CAP,C 330PF/50V	
C354	ECKW3D102KBN	CAP,C .001UF-K-2KVDC	
C357	EEANA1E1R0B	CAP,E 1.0UF-25V	
C401	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C403	ECA1HM010B	CAP,E 1UF-50V	
C404	ECA1HM010B	CAP,E 1UF-50V	
C405	ECSF1EE105VB	CAP,E 1.0UF-25V	
C407	ECA1CM100B	CAP,E 10UF-16V	
C409	TCJ2VC1H101J	CAP,C 100PF-J-50V	
C415	TCJ2VF1H104Z	CAP,C .1UF-Z-50V	
C451	ECA1HM2R2B	CAP,E 2.2UF-50V	
C452	ECQB1H473JF3	CAP,P .047UF-J-50V	
C453	ECA1VM471B	CAP,E 470UF-35V	
C454	ECA1VHG221E	CAP,E 220UF-35V	
C455	ECA1EM222E	CAP,E 2200UF-25V	
C456	ECCR1H020CC5	CAP,C 2PF-C-50V	
C457	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C458	ECA1CM101B	CAP,E 100UF/16V	
C459	ECQM1104JZW	CAP,P .10UF-J-100V	
C501	TCJ2YC1H222J	CAP,C .022UF-J-50V	
C502	ECA1CM221B	CAP,E 10UF-16V	
C503	TCJ2VC1H221J	CAP,C 220PF-J-50V	
C504	ECQB1H222JF3	CAP,P 2200PF-J-50V	
C505	TCJ2VC1H180J	CAP,C 18PF-J-50V	
C506	ECA1CM471B	CAP,E 470UF-16V	

Ref. No.	Part No.	Part Name & Description	Remarks
C507	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C508	TCJ2VC1H270J	CAP,C 27PF-J-50V	
C510	ECCR2H100D5	CAP,C 10PF-D-500V	
C511	ECKR2H821KB5	CAP,C 820PF-K-500V	
C512	ECKR2H101KB5	CAP,C 100UF-K-500V	
C514	ECA1HMR22B	CAP,E .22UF-50V	
C515	TCJ2YC1H222J	CAP,C .022UF-J-50V	
C516	TCJ2VC1H391J	CAP,C 390PF-J-50V	
C517	TCJ2VC1H221J	CAP,C 220PF-J-50V	
C518	TCJ2VC1H151J	CAP,C 150PF-J-50V	
C519	TCJ2VF1H104Z	CAP,C .1UF-Z-50V	
C531	ECA1EM220B	CAP,E 22UF-25V	
C551	ECA1VM331B	CAP,E 330UF-35V	
C552	ECA1CM331B	CAP,E 330UF-16V	
C553	ECA1CM331B	CAP,E 330UF-16V	
C554	ECKR2H561KB5	CAP,C 560PF-K-500V	
C555	ECA2EM220E	CAP,E 22UF-250V	
C556	ECA1CM102B	CAP,E 1000UF/16V	
C557	ECKR2H102KB5	CAP,C 1000PF-K-500V	
C558	ECA1CM221B	CAP,E 10UF-16V	
C560	ECEA1HN2R2UB	CAP,E 2.2UF-50V	
C561	ECKR2H561KB5	CAP,C 560PF-K-500V	
C562	ECKR2H561KB5	CAP,C 560PF-K-500V	
C563	ECWH12H133JS	CAP,P .013UF-J-1.2KV / CT-32E13-1G CT-32E13-1UG	
C563	ECWH12H822JS	CAP,P .0082UF-J-1.2KV / CT-27E13-1G CT-27E13-1UG	
C564	ECWH12H122JS	CAP,P .0012UF-J-1.2KV / CT-32E13-1G CT-32E13-1UG	
C564	ECWH12H272JS	CAP,P .0027UF-J-1.2KV / CT-27E13-1G CT-27E13-1UG	
C565	ECKW3D122JBR	CAP,C 1200PF-J-2KV / CT-27E13-1G CT-27E13-1UG	
C565	ECKW3D561JBR	CAP,C 560PF-J-2KV / CT-32E13-1G CT-32E13-1UG	
C566	ECKW3D181JBP	CAP,C 180PF-J-2KV	
C567	ECQM4562JZW	CAP,P 5600PF-J-400V / CT-32E13-1G CT-32E13-1UG	
C568	ECQM2274JZW	CAP,P .27UF-J-200V / CT-27E13-1G CT-27E13-1UG	
C568	ECQM4473JZW	CAP,P .047UF-J-400V / CT-32E13-1G CT-32E13-1UG	
C569	TACFV2E474J	CAP,M .47UF-J-200V	
C571	ECA1CM471B	CAP,E 470UF-16V	
C572	ECA1CM100B	CAP,E 10UF-16V	
C573	ECA1CM101B	CAP,E 100UF/16V	
C574	ECKR2H471KB5	CAP,C 470PF-K-500V / CT-32E13-1G CT-32E13-1UG	
C601	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C603	ECQB1H223JF3	CAP,P .022UF-J-50V	
C616	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C641	ECA1HM100B	CAP,E 10UF/50V	
C754	ECQB1H104JFW	CAP,P .1UF-J-50V / CT-32E13-1G CT-32E13-1UG	
C755	ECQB1H104JFW	CAP,P .1UF-J-50V / CT-32E13-1G CT-32E13-1UG	
C756	ECA1CM221B	CAP,E 10UF-16V / CT-32E13-1G CT-32E13-1UG	
C757	ECA1VM221B	CAP,E 220UF-35V / CT-32E13-1G CT-32E13-1UG	
C759	ECQE1395KNB	CAP,P 3.95UF-K-100V / CT-32E13-1G CT-32E13-1UG	

Ref. No.	Part No.	Part Name & Description	Remarks
C760	TACCV101T50V	CAP,C 100PF/50V / CT-32E13-1G CT-32E13-1UG	
C801	ECKWAE472ZED	CAP,C 4700PF-Z-500V	
C802	ECKWAE472ZED	CAP,C 4700PF-Z-500V	
C803	ECKWAE472ZED	CAP,C 4700PF-Z-500V	
C804	ECKWAE472ZED	CAP,C 4700PF-Z-500V	
C805	EC0S2DA221BB	CAP,E 220UF/200V / CT-27E13-1G CT-27E13-1UG	
C805	EC0S2DA331BB	CAP,E 330UF/200V / CT-32E13-1G CT-32E13-1UG	
C806	EC0S2DA221BB	CAP,E 220UF/200V / CT-27E13-1G CT-27E13-1UG	
C806	EC0S2DA331BB	CAP,E 330UF/200V / CT-32E13-1G CT-32E13-1UG	
C807	ECA1HM2R2B	CAP,E 2.2UF-50V	
C808	ECA1CM101B	CAP,E 100UF/16V	
C809	EC0S2DG151DG	CAP,E 151UF/200V	
C810	ECQU2A153MVA	CAP,P .015UF-M-250VAC	
C811	ECQU2A153MVA	CAP,P .015UF-M-250VAC	
C812	ECQU2A224MVA	CAP,P .22UF-M-250VAC	
C814	ECQB1H823JF3	CAP,P .082UF-J-50V	
C815	ECA1EHG101B	CAP,E 100UF-25V	
C818	ECKW3A821KBP	CAP,C 820PF-K-1KVDC	
C820	ECA1JHG100B	CAP,E 10UF-63V	
C821	ECKR2H152KB5	CAP,C .0015UF-K-500V	
C822	ECA1EM221B	CAP,E 220UF-25V	
C823	ECA160V33UE	CAP,E 33UF/160V	
C824	ECKW3A331KBP	CAP,C 330PF-K-1KV	
C825	ECKW3A471KBP	CAP,C 470PF-K-1KV	
C2202	ECA1HM2R2B	CAP,E 2.2UF-50V	
C2203	ECA1HM4R7B	CAP,E 4.7UF-50V	
C2204	AP106K016CAE	CAP,T 10UF/16V	
C2205	ECA1HM010B	CAP,E 1UF-50V	
C2206	ECQB1H223JF3	CAP,P .022UF-J-50V	
C2207	AP335K016CAE	CAP,T 3.3UF/16V	
C2208	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C2209	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C2210	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C2211	ECA1CM100B	CAP,E 10UF-16V	
C2212	ECQB1H473JF3	CAP,P .047UF-J-50V	
C2215	ECA0JM101B	CAP,E 100UF-6.3V	
C2218	ECA1HMR47B	CAP,E .47UF-50V	
C2301	ECA1VM102E	CAP,E 1000UF-35V	
C2302	ECA1HM010B	CAP,E 1UF-50V	
C2305	ECA1HM010B	CAP,E 1UF-50V	
C2306	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C2307	ECA1CM102B	CAP,E 1000UF/16V	
C2309	ECQB1H473JF3	CAP,P .047UF-J-50V	
C2311	ECA1HM3R3B	CAP,E 3.3UF-50V	
C2313	ECA1EM101B	CAP,E 100UF-25V	
C2314	ECQB1H473JF3	CAP,P .047UF-J-50V	
C2315	ECA1EM100B	CAP,E 10UF-25V	
C2321	ECA1EM100B	CAP,E 10UF-25V	
C2324	ECA1EM100B	CAP,E 10UF-25V	
C2325	ECA1CM102B	CAP,E 1000UF/16V	

Ref. No.	Part No.	Part Name & Description	Remarks
C2326	TCJ2VB1H223K	CAP,C .022UF-K-50V	
C2327	TCJ2VB1H223K	CAP,C .022UF-K-50V	
C2328	TCJ2VB1H223K	CAP,C .022UF-K-50V	
C2329	TCJ2VB1H223K	CAP,C .022UF-K-50V	
C2331	ECA1HM010B	CAP,E 1UF-50V	
C2333	ECA1HM010B	CAP,E 1UF-50V	
C2339	ECA1HM010B	CAP,E 1UF-50V	
C2340	ECA1HM010B	CAP,E 1UF-50V	
C2342	ECA1CM470B	CAP,E 47UF/16V	
C2350	EEANA1E100B	CAP,E 10UF-25V	
C2351	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C2352	TCJ2VB1H472K	CAP,C 4700PF-K-50V	
C2353	ECA1HM4R7B	CAP,E 4.7UF-50V	
C2354	ECA1HM4R7B	CAP,E 4.7UF-50V	
C2355	ECA1HM4R7B	CAP,E 4.7UF-50V	
C2356	ECA1HMR47B	CAP,E .47UF-50V	
C2357	ECA1CM100B	CAP,E 10UF-16V	
C2358	EEANA1E100B	CAP,E 10UF-25V	
C2359	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C2360	TCJ2VB1H472K	CAP,C 4700PF-K-50V	
C2361	ECA1AM470B	CAP,E 47UF-10V	
C2362	ECQB1H104JF3	CAP,P .10UF-J-50V	
C2363	TCJ2VB1C104K	CAP,C .1UF-K-16V	
C2364	ECA1HM4R7B	CAP,E 4.7UF-50V	
C2365	ECA1AM470B	CAP,E 47UF-10V	
C2366	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C3001	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C3002	ECA1AM101B	CAP,E 100UF-10V	
C3003	ECA1CM100B	CAP,E 10UF-16V	
C3004	ECA1HM010B	CAP,E 1UF-50V	
C3006	ECA1HM010B	CAP,E 1UF-50V	
C3007	ECA1CM100B	CAP,E 10UF-16V	
C3008	ECA1CM100B	CAP,E 10UF-16V	
C3009	ECA1HM010B	CAP,E 1UF-50V	
C3010	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C3011	ECA1HM010B	CAP,E 1UF-50V	
C3012	ECA1CM100B	CAP,E 10UF-16V	
C3013	ECA1CM100B	CAP,E 10UF-16V	
C3014	ECA1HM010B	CAP,E 1UF-50V	
C3016	ECA1HM010B	CAP,E 1UF-50V	
C3018	ECA1CM100B	CAP,E 10UF-16V	
C3019	ECA1CM100B	CAP,E 10UF-16V	
C3020	ECA1HM010B	CAP,E 1UF-50V	
C3021	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C3022	ECA1HM010B	CAP,E 1UF-50V	
C3023	ECA1CM100B	CAP,E 10UF-16V	
C6501	ECA0JM101B	CAP,E 100UF-6.3V	
C6502	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C6504	TCJ2VC1H270J	CAP,C 27PF-J-50V	
C6507	TCJ2VC1H120J	CAP,C 12PF-J-50V	
C6510	TCJ2VC1H120J	CAP,C 12PF-J-50V	
C6511	ECA1HM010B	CAP,E 1UF-50V	
C6512	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C6513	TCJ2VC1H270J	CAP,C 27PF-J-50V	

Ref. No.	Part No.	Part Name & Description	Remarks
C6516	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C6517	ECEA1HN010UB	CAP,E 1UF/50V	
C6518	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C6520	ECA1CM100B	CAP,E 10UF-16V	
C6521	ECA1AM470B	CAP,E 47UF-10V	
C6522	TCJ2VC1H221J	CAP,C 220PF-J-50V	
C6523	TCJ2VF1H104Z	CAP,C .1UF-Z-50V	
C6524	ECA1HM010B	CAP,E 1UF-50V	
C6525	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C6526	ECA1CM100B	CAP,E 10UF-16V	
C6527	TCJ2VF1H104Z	CAP,C .1UF-Z-50V	
C6528	ECA1AM470B	CAP,E 47UF-10V	
C6529	ECA1CM100B	CAP,E 10UF-16V	
C6531	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
C6532	TCJ2VF1H103Z	CAP,C .01UF-Z-50V	
JS2306	TCJ2VB1H472K	CAP,C 4700PF-K-50V	
DIODES			
D001	B0EAKL000008	DIODE, RECTIFIER	
D002	MA2C165001VT	DIODE, SWITCHING	
D003	MAZ40560MF	DIODE, ZENER	
D006	MAZ43300HF	DIODE, ZENER	
D007	B0EAKL000008	DIODE, RECTIFIER	
D008	B0EAKL000008	DIODE, RECTIFIER	
D009	B0EAKL000008	DIODE, RECTIFIER	
D011	MA2C165001VT	DIODE	
D014	MA2C165001VT	DIODE	
D015	MA2C700A0F	DIODE	
D018	MA2C165001VT	DIODE, SWITCHING	
D451	B0EAKL000008	DIODE, RECTIFIER	
D502	MA4062LTVTA	DIODE, ZENER	⚠
D530	MAZ40820LF	DIODE, ZENER	
D531	B0HAMP000008	DIODE	⚠
D532	MAZ40910LF	DIODE, ZENER	
D533	MAZ40910MF	DIODE, ZENER	
D551	B0HAMP000039	DIODE	⚠
D554	BYD33G-163	DIODE	⚠
D555	MA2C165001VT	DIODE, SWITCHING	⚠
D556	MAZ43600HF	DIODE, ZENER	
D557	B0HAMP000039	DIODE	
D558	B0HANV000008	DIODE	⚠
D559	BYD33G-113	DIODE	⚠
D561	BYD33G-163	DIODE	⚠
D751	MA2270B	DIODE / CT-32E13-1G CT-32E13-1UG	
D801	GP15KL-042	DIODE	⚠
D802	GP15KL-042	DIODE	⚠
D805	TAP2AA0002	PTC 3-OHM	⚠
D806	MAZ40470MF	DIODE, ZENER	⚠
D807	MA2C165001VT	DIODE, SWITCHING	
D809	B0HANL000004	DIODE, RECTIFIER	⚠
D820	EU02V1	DIODE	

Ref. No.	Part No.	Part Name & Description	Remarks
D821	EU02V1	DIODE	
D822	EU02V1	DIODE	
D823	RL30A	DIODE	
D824	EU02V1	DIODE	
D825	B0ZAZ0000045	DIODE, PROTECTION	
D826	EU02V1	DIODE	
D829	MA2C165001VT	DIODE, SWITCHING	
D830	MAZ42700MF	DIODE, ZENER	
D2301	MA2C165001VT	DIODE	
D2305	MAZ41100MF	DIODE, ZENER	
D2306	MAZ41100MF	DIODE, ZENER	
D2307	MAZ41100MF	DIODE, ZENER	
D2308	MAZ41100MF	DIODE, ZENER	
D2309	MAZ41100MF	DIODE, ZENER	
D2310	MAZ41100MF	DIODE, ZENER	
D2311	MAZ41100MF	DIODE, ZENER	
D2312	MAZ41100MF	DIODE, ZENER	
D2315	MA2C165001VT	DIODE, SWITCHING	
D2342	MA2C165001VT	DIODE, SWITCHING	
D2343	MA2C165001VT	DIODE, SWITCHING	
D3001	MAZ41100MF	DIODE, ZENER	
D3002	MAZ41100MF	DIODE, ZENER	
D3003	MAZ41100MF	DIODE, ZENER	
D3004	MAZ41100MF	DIODE, ZENER	
D3005	MAZ41100MF	DIODE, ZENER	
D3006	MAZ41100MF	DIODE, ZENER	
D3007	MAZ41100MF	DIODE, ZENER	
D3008	MAZ41100MF	DIODE, ZENER	
D3009	MAZ41100MF	DIODE, ZENER / CT-32E13-1G CT-32E13-1UG	
D3010	MAZ41100MF	DIODE, ZENER	
D3011	MAZ41100MF	DIODE, ZENER	
D3012	MAZ41100MF	DIODE, ZENER	
D3017	MAZ41100MF	DIODE, ZENER	
D3018	MAZ41100MF	DIODE, ZENER	
D3019	MAZ41100MF	DIODE, ZENER	
D3020	MAZ41100MF	DIODE, ZENER	
D3021	MAZ41100MF	DIODE, ZENER	
D3022	MAZ41100MF	DIODE, ZENER	
FUSES			
F801	XBA2A00101	FUSE 6.3A 125V	
INTEGRATED CIRCUITS			
IC001	MN101C46FTH	IC MPU	
IC002	TVR2AJ126	IC EEPROM	
IC003	PIC-37042SR	IC IR RECEIVER	
IC005	C0CBABC00037	IC VOLTAGE REGULATOR	
IC006	PST9128NR	IC RESET	
IC101	TA1310DN	IC VCJ	
IC451	C1AA00000529	IC V-OUT	
IC551	AN78M09LB	IC VOLTAGE REGULATOR 9V	
IC552	AN7805LB	IC VOLTAGE REGULATOR 5V	
IC801	0N3131R	IC OPTO ISOLATOR	

Ref. No.	Part No.	Part Name & Description	Remarks
IC803	C5HABZZ00062	IC POWER SUPPLY B+	
IC2201	AN5849S-E1V	IC MTS	
IC2302	AN5272	IC AUDIO AMPLIFIER	
IC2351	C1AA00000163	IC S-AGC	
IC3001	M52790SP	IC A/V SWITCH	
IC6501	MN82840	IC 3 LINE COMB FILTER	
IC6502	PST9142NR	IC COMB FILTER RESET	
COILS			
L001	EXCELSA26T	FERRITE BEAD	
L002	G0C2R2KA0021	COIL, PEAKING 2.2UH	
L003	G0C2R2KA0021	COIL, PEAKING 2.2UH	
L004	G0C2R2KA0021	COIL, PEAKING 2.2UH	
L005	ELESN330KA	COIL, PEAKING 33UH	
L006	EXCELSA24T	FERRITE BEAD	
L007	ELESN180JA	COIL, PEAKING 18UH	
L008	G0C470KA0021	COIL, PEAKING 2.2UH	
L010	G0C2R2KA0021	COIL, PEAKING 2.2UH	
L011	G0C2R2KA0021	COIL, PEAKING 2.2UH	
L012	G0C2R2KA0021	COIL, PEAKING 2.2UH	
L013	G0C2R2KA0021	COIL, PEAKING 2.2UH	
L106	EXCELSA26T	FERRITE BEAD	
L108	EXCELSA26T	FERRITE BEAD	
L109	EXCELSA26T	FERRITE BEAD	
L110	EXCELSA39V	FERRITE BEAD	
L218	EXCELSA26T	FERRITE BEAD	
L319	G0C101KA0021	COIL, PEAKING 100UH	
L351	G0C101KA0021	COIL, PEAKING	
L430	EXCELSA39V	FERRITE BEAD	
L501	ELESN3R3KA	COIL, PEAKING 3.3UH	
L518	ELESN120JA	COIL, PEAKING 12UH	
L541	EXCELD35V	FERRITE BEAD	
L542	EXCELSA39V	FERRITE BEAD	
L551	ELH5L7103	COIL, HORIZ. LINEARITY / CT-27E13-1G CT-27E13-1UG	
L551	ELH5L7115	COIL, HORIZ. LINEARITY / CT-32E13-1G CT-32E13-1UG	
L554	EXCELSA24T	FERRITE BEAD	
L555	EXCELSA24T	FERRITE BEAD	
L556	EXCELSA24T	FERRITE BEAD	
L751	ELC18B301L	COIL, CHOKE / CT-32E13-1G CT-32E13-1UG	
L752	EXCELD35V	FERRITE BEAD / CT-32E13-1G CT-32E13-1UG	
L801	ELF20N020A	COIL, 2UH	
L803	ELF17N007A	LINE FILTER	
L804	EXCELSA39V	FERRITE BEAD	
L2310	TLUABTA2R2K	COIL, PEAKING 2.2UH	
L6502	ELESN330JA	COIL, PEAKING 33UH	
L6505	ELESN330JA	COIL, PEAKING 33UH	
L6507	ELESN150KA	COIL, PEAKING 15UH	
L6508	EXCELSA26T	FERRITE BEAD	
TRANSISTORS			
Q001	2SD601ARTX	TRANSISTOR	
Q002	2SC1685QRSTA	TRANSISTOR	
Q003	2SD601ARTX	TRANSISTOR	
Q004	2SC1685QRSTA	TRANSISTOR	

Ref. No.	Part No.	Part Name & Description	Remarks
Q005	2SD601ARTX	TRANSISTOR	
Q201	2SD601ARTX	TRANSISTOR	
Q303	2SD601ARTX	TRANSISTOR	
Q351	2SC3063RL	TRANSISTOR	
Q352	2SC3063RL	TRANSISTOR	
Q353	2SC3063RL	TRANSISTOR	
Q401	2SD601ARTX	TRANSISTOR	
Q402	2SD601ARTX	TRANSISTOR	
Q501	2SC4212HLB	TRANSISTOR	
Q509	2SD601ARTX	TRANSISTOR	
Q515	2SD601ARTX	TRANSISTOR	
Q551	2SC5339LBMA1	TRANSISTOR	
Q603	2SD601ARTX	TRANSISTOR	
Q751	2SC1685QRSTA	TRANSISTOR / CT-32E13-1G CT-32E13-1UG	
Q752	2SA564AQRSTA	TRANSISTOR / CT-32E13-1G CT-32E13-1UG	
Q753	2SD12660POLB	TRANSISTOR / CT-32E13-1G CT-32E13-1UG	
Q801	2SC1685RSTA	TRANSISTOR	
Q802	2SC1384RS	TRANSISTOR	
Q2302	2SB709ARTX	TRANSISTOR	
Q2303	2SD601ARTX	TRANSISTOR	
Q2342	2SB709ARTX	TRANSISTOR	
Q2343	2SD601ARTX	TRANSISTOR	
Q2344	2SD601ARTX	TRANSISTOR	
Q2409	2SD601ARTX	TRANSISTOR	
Q2410	2SD601ARTX	TRANSISTOR	
Q6501	2SD601ARTX	TRANSISTOR	
Q6502	2SD601ARTX	TRANSISTOR	
Q6504	2SD601ARTX	TRANSISTOR	
Q6505	2SD601ARTX	TRANSISTOR	
Q6506	2SD601ARTX	TRANSISTOR	
Q6509	2SD601ARTX	TRANSISTOR	
Q6510	2SB709ARTX	TRANSISTOR	
Q6514	2SB709ARTX	TRANSISTOR	
Q6516	2SB709ARTX	TRANSISTOR	
Q6517	2SD601ARTX	TRANSISTOR	
Q6519	2SD601ARTX	TRANSISTOR	
RELAYS			
RL801	TSEH8007	RELAY	
RESISTORS			
R001	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R002	ERJ6GEYJ182V	RES,M 1.8K-J-1/10W	
R003	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R004	ERDS1TJ122T	RES,C 1.2K-J-1/2W	
R005	ERDS2TJ101T	RES,C 100-J-1/4W	
R006	ERDS1TJ560T	RES,C 56-J-1/2W	
R007	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R008	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R009	ERJ6GEYJ221V	RES,M 220-J-1/10W	
R010	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R012	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R013	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R014	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W	
R015	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W	

1949	1950-1974	1975-1999	
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Ref. No.	Part No.	Part Name & Description	Remarks
R016	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W	
R017	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W	
R020	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W	
R021	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R022	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R023	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R024	ERJ6GEYJ221V	RES,M 220-J-1/10W	
R025	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R027	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R028	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R030	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R032	ERJ6ENF1002V	RES,M 10K-F-1/10W	
R033	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W	
R034	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W	
R035	ERJ6GEYJ362V	RES,M 3.6K-J-1/10W	
R036	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R037	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R038	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R039	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R040	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W	
R041	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W	
R042	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R044	ERJ6GEYJ273V	RES,M 27K-J-1/10W	
R045	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R046	ERJ6GEYJ333V	RES,M 33K-J-1/10W	
R047	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R049	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R060	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R066	ERJ6GEYJ752V	RES,M 7.5K-J-1/10W	
R067	ERJ6GEYJ752V	RES,M 7.5K-J-1/10W	
R068	ERJ6GEYJ752V	RES,M 7.5K-J-1/10W	
R072	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R073	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R074	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R075	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R076	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R077	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R078	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R079	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R201	ERJ6GEYJ331V	RES,M 330-J-1/10W	
R223	ERJ6GEYJ561V	RES,M 560-J-1/10W	
R225	ERJ6GEYJ331V	RES,M 330-J-1/10W	
R226	ERJ6GEYJ331V	RES,M 330-J-1/10W	
R245	ERJ6GEYJ224V	RES,M 220K-J-1/10W	
R301	ERJ6GEYJ331V	RES,M 330-J-1/10W	
R302	ERJ6GEYJ331V	RES,M 330-J-1/10W	
R303	ERJ6GEYJ331V	RES,M 330-J-1/10W	
R306	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R310	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W	
R312	ERJ6GEYJ393V	RES,M 39K-J-1/10W	
R328	ERJ6GEYJ105V	RES,M 1M-J-1/10W	
R341	ERJ6GEYJ393V	RES,M 39K-J-1/10W / CT-27E13-1G CT-27E13-1UG	
R341	ERJ6GEYJ474V	RES,M 470K-J-1/10W / CT-32E13-1G CT-32E13-1UG	
R351	ERG2FJ123H	RES,M 12K-J-2W	

Ref. No.	Part No.	Part Name & Description	Remarks
R352	ERG2FJ123H	RES,M 12K-J-2W	
R353	ERG2FJ123H	RES,M 12K-J-2W	
R354	ERDS1TJ272T	RES,C 2.7K-J-1/2W	
R355	ERDS1TJ272T	RES,C 2.7K-J-1/2W	
R356	ERDS1TJ272T	RES,C 2.7K-J-1/2W	
R357	ERDS2TJ181T	RES,C 180-J-1/4W	
R358	ERDS2TJ181T	RES,C 180-J-1/4W	
R359	ERDS2TJ181T	RES,C 180-J-1/4W	
R360	ERDS2TJ821T	RES,C 820-J-1/4W	
R361	ERDS2TJ821T	RES,C 820-J-1/4W	
R362	ERDS2TJ821T	RES,C 820-J-1/4W	
R363	ERDS2TJ101T	RES,C 100-J-1/4W	
R364	ERDS2TJ101T	RES,C 100-J-1/4W	
R365	ERDS2TJ101T	RES,C 100-J-1/4W	
R401	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R402	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R403	ERJ6GEYJ622V	RES,M 6.2K-J-1/10W	
R405	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R408	ERJ6GEYJ331V	RES,M 330-J-1/10W	
R409	ERJ6GEYJ271V	RES,M 270-J-1/10W	
R410	ERJ6ENF1272V	RES,M 12.7K-F-1/10W	
R411	ERJ6ENF6801V	RES,M 6.8K-F-1/10W	
R412	ERDS2TJ123T	RES,C 12K-J-1/4W	
R452	ERDS1FJ1R8P	RES,C 1.8-J-1/2W	
R453	ERJ6GEYJ123V	RES,M 12K-J-1/10W	
R454	ERJ6GEYJ473V	RES,M 47K-J-1/10W	
R455	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R456	ERG3FJ151H	RES,M 150-J-3W	
R457	ERDS1FJ1R5P	RES,C 1.5-J-1/2W	
R458	ERDS1FJ2R7P	RES,C 2.7-J-1/2W	
R459	ERDS2TJ122T	RES,C 1.2K-J-1/4W	
R460	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R461	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R465	ERJ6GEYJ104V	RES,M 100K-J-1/10W	
R468	ER0S2THF4321	RES,M 4.32K-F-1/4W	
R469	ER0S2THF1471	RES,M 1.47K-F-1/4W	
R470	ERDS2TJ102T	RES,C 1K-J-1/4W	
R501	ERJ6GEYJ301V	RES,M 300-J-1/10W	
R502	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R503	TCJ2VC1H270J	CAP,C 27PF-J-50V	
R504	ERJ6GEYJ333V	RES,M 33K-J-1/10W	
R505	ERDS1TJ181T	RES,C 180-J-1/2W	
R506	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W	
R507	ERJ6GEYJ561V	RES,M 560-J-1/10W	
R508	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R509	ERJ6GEYJ221V	RES,M 220-J-1/10W	
R510	ERG3FJ202H	RES,M 2K-J-3W / CT-32E13-1G CT-32E13-1UG	
R510	ERG3FJ222H	RES,M 2200-J-3W / CT-27E13-1G CT-27E13-1UG	
R511	ERG3FJ202H	RES,M 2K-J-3W / CT-32E13-1G CT-32E13-1UG	
R511	ERG3FJ272H	RES,M 2.7K-J-3W / CT-27E13-1G CT-27E13-1UG	
R512	ERG2FJ392H	RES,M 3.9K-J-2W	
R513	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R514	ERJ6GEYJ102V	RES,M 1K-J-1/10W / CT-32E13-1G CT-32E13-1UG	

1927	1906-1927	1901-1927 / 1928-1930 / 1931-1933	
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Ref. No.	Part No.	Part Name & Description	Remarks
R514	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W / CT-27E13-1G CT-27E13-1UG	
R515	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R516	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W	
R517	ERJ6GEYJ181V	RES,M 180-J-1/10W	
R531	ERD25FJ470P	RES,C 47-J-1/4W	
R532	ERJ6ENF5362V	RES,M 53.6K-F-1/10W / CT-32E13-1G CT-32E13-1UG	
R532	ERJ6ENF5602V	RES,M 56K-F-1/10W / CT-27E13-1G CT-27E13-1UG	
R533	ERJ6ENF1692V	RES,M 16.9K-F-1/10W / CT-32E13-1G CT-32E13-1UG	
R533	ERJ6ENF2102V	RES,M 21K-F-1/10W / CT-27E13-1G CT-27E13-1UG	
R550	ERDS1FJ1R0P	RES,C 1.0-J-1/2W / CT-27E13-1G CT-27E13-1UG	
R551	ERDS1FJ1R0P	RES,C 1.0-J-1/2W	
R552	ERDS1FJ1R0T	RES,C 1.0-J-1/2W	
R553	ERG3FJ270H	RES,M 27-J-3W	
R556	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W	
R557	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R558	ERQ1CZKPR22S	RES,F .22-K-1W / CT-27E13-1G CT-27E13-1UG	
R558	ERQ2CJP1R8S	RES,F 1.8-J-2W / CT-32E13-1G CT-32E13-1UG	
R559	ERG2FJ683H	RES,M 12K-J-2W	
R560	G0C101KA0021	COIL, PEAKING	
R561	ERG2FJ102H	RES,M 1K-J-2W	
R563	ERDS2TJ683T	RES,C 68K-J-1/4W	
R564	ERDS2TJ563T	RES,C 56K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R564	ERDS2TJ823T	RES,C 82K-J-1/4W / CT-27E13-1G CT-27E13-1UG	
R566	ERDS1FJ1R0P	RES,C 1.0-J-1/2W	
R574	ERG2FJ270H	RES,M 27-J-2W	
R601	ERJ6GEYJ391V	RES,M 390-J-1/10W	
R618	ERJ6GEYJ474V	RES,M 470K-J-1/10W	
R619	ERJ6GEYJ563V	RES,M 56K-J-1/10W	
R620	ERJ6GEYJ153V	RES,M 15K-J-1/10W	
R752	ERDS2TJ333T	RES,C 33K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R753	ERDS2TJ103T	RES,C 10K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R754	ERG3FJ562	RES,M 5.6K-J-3W / CT-32E13-1G CT-32E13-1UG	
R755	ERDS2TJ563T	RES,C 56K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R756	ERDS2TJ103T	RES,C 10K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R757	ERDS2TJ224T	RES,C 220K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R758	ERDS2TJ273T	RES,C 27K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R759	ERDS2TJ222T	RES,C 2.2K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R760	EVND8AA03B53	CONTROL 5K / CT-32E13-1G CT-32E13-1UG	
R761	EVND8AA03B14	CONTROL 10K / CT-32E13-1G CT-32E13-1UG	
R762	ERDS2TJ182T	RES,C 1.8K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R763	ERDS2TJ183T	RES,C 18K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R764	ERDS2TJ154T	RES,C 150K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R765	ERDS2TJ272T	RES,C 2.7K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R766	ERDS2TJ362T	RES,C 3.6K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R767	ERDS2TJ222T	RES,C 2.2K-J-1/4W / CT-32E13-1G CT-32E13-1UG	
R768	ERQ2CJP100S	RES,F 10-J-2W / CT-32E13-1G CT-32E13-1UG	
R801	ERF7ZK1R5	RES,W 1.5-K-7W	
R804	D0DF1R8KA002	RES,W 1.8-K-1/2W	
R805	ERDS2TJ274T	RES,C 27K-J-1/4W	
R806	ERDS2TJ274T	RES,C 27K-J-1/4W	

1999	2001-2011	2012-2014	
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Ref. No.	Part No.	Part Name & Description	Remarks
R808	ERDS1FJ1R0T	RES,C 1.0-J-1/2W	
R809	ERDS1FJ1R0T	RES,C 1.0-J-1/2W	
R810	ERDS1FJ272T	RES,C 2.7K-J-1/2W	
R812	ERDS1TJ183T	RES,C 18K-J-1/2W	
R813	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R815	ERC12ZGK825D	RES,C 8.2MEG-K-1/2W / CT-32E13-1G CT-32E13-1UG	
R815	ERC12ZGM825D	RES,S 8.2MEG-M-1/2 / CT-27E13-1G CT-27E13-1UG	
R818	ERQ12HJR56P	RES,F .56-J-1/2W	
R820	ERJ6GEYJ273V	RES,M 27K-J-1/10W	
R821	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W	
R822	ERD50FJ474P	RES,C 470K-J-1/2W	
R823	ERDS2TJ222T	RES,C 2.2K-J-1/4W	
R824	ERG3FJ390H	RES,M 39-J-3W	
R825	ERDS2TJ102T	RES,C 1K-J-1/4W	
R826	ERF2AKR18P	RES,W .18-K-2W / CT-32E13-1G CT-32E13-1UG	
R826	ERF2AKR22P	RES,W .22-K-2W / CT-27E13-1G CT-27E13-1UG	
R827	ERDS1FJ561P	RES,C 560-J-1/2W	
R828	ERG3FJ470	RES,M 47-J-3W	
R829	ERQ14AJ6R8P	RES,F 6.8-J-1W	
R2203	ERJ6GEYJ751V	RES,M 750-J-1/10W	
R2206	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R2207	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R2221	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R2301	ERQ2CJP2R2S	RES,F 2.2-J-2W	
R2305	ERD25FJ180T	RES,C 18-J-1/4	
R2306	ERD25FJ180T	RES,C 18-J-1/4	
R2307	ERJ6GEYJ221V	RES,M 220-J-1/10W	
R2308	ERJ6GEYJ221V	RES,M 220-J-1/10W	
R2311	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R2312	ERJ6GEYJ752V	RES,M 7.5K-J-1/10W	
R2313	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R2318	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W	
R2319	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R2321	ERDS2TJ181T	RES,C 180-J-1/4W	
R2322	ERDS2TJ181T	RES,C 180-J-1/4W	
R2323	ERJ6GEYJ822V	RES,M 8.2K-J-1/10W	
R2325	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R2329	ERJ6GEYJ751V	RES,M 750-J-1/10W	
R2330	ERJ6GEYJ183V	RES,M 18K-J-1/10W	
R2332	ERJ6GEYJ751V	RES,M 750-J-1/10W	
R2333	ERJ6GEYJ183V	RES,M 18K-J-1/10W	
R2334	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W	
R2336	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W	
R2337	ERJ6GEYJ221V	RES,M 220-J-1/10W	
R2338	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R2339	ERJ6GEYJ221V	RES,M 220-J-1/10W	
R2340	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R2341	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W	
R2342	ERJ6GEYJ223V	RES,M 22K-J-1/10W	
R2343	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W	
R2344	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R2345	ERJ6GEYJ223V	RES,M 22K-J-1/10W / CT-27E13-1G CT-27E13-1UG	
R2345	ERJ6GEYJ561V	RES,M 560-J-1/10W / CT-32E13-1G CT-32E13-1UG	

Ref. No.	Part No.	Part Name & Description	Remarks
R2346	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R2350	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W	
R2351	ERJ6GEYJ105V	RES,M 1M-J-1/10W	
R2352	ERJ6GEYJ105V	RES,M 1M-J-1/10W	
R2353	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R2355	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W	
R2418	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R2419	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R3001	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R3003	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W	
R3004	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W	
R3005	ERJ6GEYJ330V	RES,M 33-J-1/10W	
R3006	ERJ6GEYJ750V	RES,M 75-J-1/10W	
R3007	ERJ6GEYJ750V	RES,M 75-J-1/10W	
R3008	ERJ6GEYJ750V	RES,M 75-J-1/10W	
R3009	ERJ6GEYJ750V	RES,M 75-J-1/10W	
R3010	ERJ6ENF75R0V	RES,M 75.0-F-1/10W	
R3011	ERJ6ENF75R0V	RES,M 75.0-F-1/10W	
R3012	ERJ6GEYJ750V	RES,M 75-J-1/10W	
R3013	ERDS2TJ331T	RES,C 330-J-1/4W	
R3014	ERJ6GEYJ330V	RES,M 33-J-1/10W	
R3015	ERDS2TJ102T	RES,C 1K-J-1/4W	
R3016	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R3017	ERJ6GEYJ330V	RES,M 33-J-1/10W	
R3018	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R3019	ERDS2TJ102T	RES,C 1K-J-1/4W	
R3020	ERJ6GEYJ330V	RES,M 33-J-1/10W	
R6501	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R6502	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R6503	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R6505	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R6509	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R6510	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R6511	ERJ6GEYJ123V	RES,M 12K-J-1/10W	
R6512	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R6513	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W	
R6515	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R6516	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R6518	ERJ6GEYJ333V	RES,M 33K-J-1/10W	
R6519	ERJ6GEYJ333V	RES,M 33K-J-1/10W	
R6520	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R6522	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R6523	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W	
R6524	ERJ6GEYJ471V	RES,M 470-J-1/10W	
R6526	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R6535	ERJ6GEYJ181V	RES,M 180-J-1/10W	
R6537	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W	
R6538	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W	
R6540	ERJ6GEYJ151V	RES,M 150-J-1/10W	
R6542	ERJ6GEYJ680V	RES,M 68-J-1/10W	
R6543	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W	
R6544	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R6545	ERJ6GEYJ221V	RES,M 220-J-1/10W	
R6548	ERJ6GEYJ471V	RES,M 470-J-1/10W	

Ref. No.	Part No.	Part Name & Description	Remarks
R6549	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W	
R6553	ERJ6GEYJ101V	RES,M 100-J-1/10W	
R6554	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W	
R6555	ERJ6GEYJ153V	RES,M 15K-J-1/10W	
R6556	ERJ6GEYJ333V	RES,M 33K-J-1/10W	
R6557	ERJ6GEYJ123V	RES,M 12K-J-1/10W	
R6558	ERJ6GEYJ103V	RES,M 10K-J-1/10W	
R6559	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W	
R6560	ERJ6GEYJ124V	RES,M 120K-J-1/10W	
R6565	ERJ6GEYJ102V	RES,M 1K-J-1/10W	
R6566	ERJ6GEYJ681V	RES,M 680-J-1/10W	
R6567	ERJ6GEYJ561V	RES,M 560-J-1/10W	
R6568	ERJ6GEYJ471V	RES,M 470-J-1/10W	
SWITCHES			
S001	TSE2AD001	SWITCH, PUSH	
S002	TSE2AD001	SWITCH, PUSH	
S003	TSE2AD001	SWITCH, PUSH	
S004	TSE2AD001	SWITCH, PUSH	
S005	TSE2AD001	SWITCH, PUSH	
S008	TSE2AD001	SWITCH, PUSH	
S009	TSE2AD001	SWITCH, PUSH	
TRANSFORMERS			
T001	TLP16297	TRANSFORMER POWER SUPPLY	
T501	ETH19Y211AZ	TRASNFORMER	
T502	ETE19Z30DY	TRANSFORMER	
T551	TLF2AA002	TRANSFORMER, FLYBACK / CT-27E13-1G CT-27E13-1UG	
T551	TLF2AA003	TRANSFORMER, FLYBACK / CT-32E13-1G CT-32E13-1UG	
T751	ETE19Z30EY	TRANSFORMER / CT-32E13-1G CT-32E13-1UG	
T801	ETS29AK3L5NC	TRANSFORMER, SWITCHING / CT-32E13-1G CT-32E13-1UG	
T801	TLP2AA003	TRANSFORMER, SWITCHING / CT-27E13-1G CT-27E13-1UG	
CRYSTALS/FILTERS			
X001	TSSA092	CRYSTAL OSCILLATOR	
X501	TSS2AA001	CRYSTAL, 3.58MHZ	
X601	H2A503300008	CERAMIC OSCILLATOR	
OTHERS			
TNR001	ENG36604GR	TUNER	
M001	TSX2AA0111-1	A/C LINE CORD / CT-32E13-1G CT-32E13-1UG	
M002	M68LGL061X	CRT 27 INCH / CT-27E13-1G CT-27E13-1UG	
M003	M80JUA061X	CRT 32 INCH / CT-32E13-1G CT-32E13-1UG	
M004	TJSC00300	CRT SOCKET	
DY	TLY2AA006	DEFLECTION YOKE / CT-27E13-1G CT-27E13-1UG	
DY	TLY2AA008	DEFLECTION YOKE / CT-32E13-1G CT-32E13-1UG	
M005	JH291U-009	YOKE, CONVERGENCE	
M006	TMM2A30702	WEDGE, YOKE	
DEG	TLK2AA0011	COIL, DEGAUSSING 27 INCH / CT-27E13-1G CT-27E13-1UG	
DEG	TSP2AA007	COIL, DEGAUSSING 32 INCH / CT-32E13-1G CT-32E13-1UG	
M007	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP	
M008	TXF3A011EV	ASSY., DAG GND / CT-27E13-1G CT-27E13-1UG	

Ref. No.	Part No.	Part Name & Description	Remarks
M009	TXF3A01AFRA	ASSY., DAG GND / CT-32E13-1G CT-32E13-1UG	
M010	TSN63115-4	MAGNET, PURITY	
M011	TAS2AA0015	SPEAKER 8 OHM 5W / CT-27E13-1G CT-27E13-1UG	
M012	TAS2AA0016	SPEAKER 8 OHM 5W / CT-32E13-1G CT-32E13-1UG	
M013	TBM2AA0023	BADGE, PANASONIC / CT-32E13-1G CT-32E13-1UG	
M014	TBM2A10143	BADGE, PANASONIC / CT-27E13-1G CT-27E13-1UG	
M015	TBX2AA2601	BUTTON, 7 KEY	
M016	TKX2AA00407	GUIDE, IR	
M017	TXFKU02GSER	OVERLAY, BACK COVER, X-RAY LABEL ENGLISH, X-RAY LABEL FRENCH / CT-32E13-1G CT-32E13-1UG	
M018	TXFKY05GSER	BADGE PANASONIC, IR GUIDE, / LABEL SERVICE INFORMATION, / FRONT CABINET / CT-32E13-1G CT-32E13-1UG	
M019	TXFKU01GSER	OVERLAY, BACK COVER, X-RAY LABEL ENGLISH, X-RAY LABEL FRENCH / CT-27E13-1G CT-27E13-1UG	
M020	TKFKY01GSER	BADGE PANASONIC, IR GUIDE, LABEL SERVICE INFORMATION, FRONT CABINET / CT-27E13-1G CT-27E13-1UG	
JK3001	TJB2AA0221	TERMINAL, BACK A/V	
JK3002	TJB2AA0046	TERMINAL, FRONT A/V	
JK3003	TJB2AA0171	TERMINAL, S-VIDEO	
JK3004	TJB2AA0211-1	TERMINAL, AUDIO OUT	
ACCESSORIES			
M021	EUR7613Z60	REMOTE CONTROL	
M022	UR76EC0303D	BATTERY COVER, REMOTE CONTROL	
M023	TQB2AA0484	OWNERS MANUAL	

Service Manual

Color Television

Main Manual
(NA8)



Panasonic

Models	Chassis
CT-27D10B	AP338
CT-27D10UB	AP338
CT-27D10DB	AP338

This Service manual is issued as a service guide for the models of the **NA8** family listed above. Included in this manual are a set of schematic, block diagrams, functional descriptions, alignment procedures, disassembly procedures, and a complete parts list.

WARNING! This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death."

The service technician is required to read and follow the **"Safety Precautions"** and **"Important Safety Notice"** in this Main Manual.

Panasonic®

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Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol  and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent X-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

Safety Precautions

General Guidelines

An **Isolation Transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the Receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

Always Replace Protective Devices, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this Receiver is operating. Operation of the Receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

Extreme care should be practiced when **Handling the Picture Tube**. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **Test Picture Tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits the X-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **40kV** without causing X-ray radiation.

Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed

metallic part has a return path to the chassis, the reading should be between 240k Ω and 5.2M Ω . If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

Leakage Current Hot Check (Fig. 1)

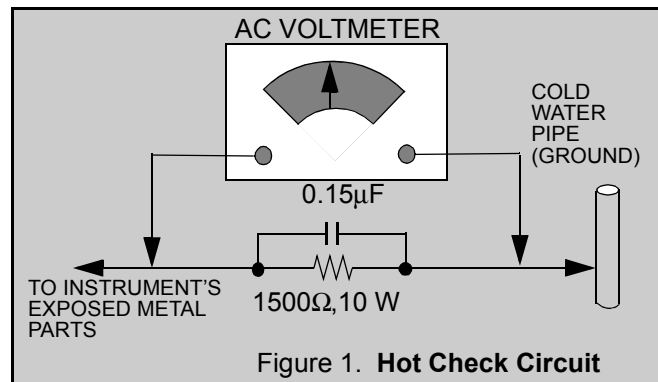
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5k Ω 10 watt resistor in parallel with a 0.15 μ F capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 1/2 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.



X-ray Radiation

WARNING: The potential source of X-ray radiation in the TV set is in the High Voltage section and the picture tube.

Note: *It is important to use an accurate, calibrated high voltage meter.*

Set the **brightness, picture, sharpness** and **color** controls to Minimum. Measure the High Voltage. The high voltage should be **28.30kV $\pm$ 1.25kV**. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal Oscillator Disable Circuit Test

This test must be performed as a final check before the Receiver is returned to the customer. See **Horizontal Oscillator Disable Circuit Procedure Check** in this manual.

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Service Notes

Note: These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

Leadless Chip Component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6k Ω resistor, 0 = 0 Ω (jumper). Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

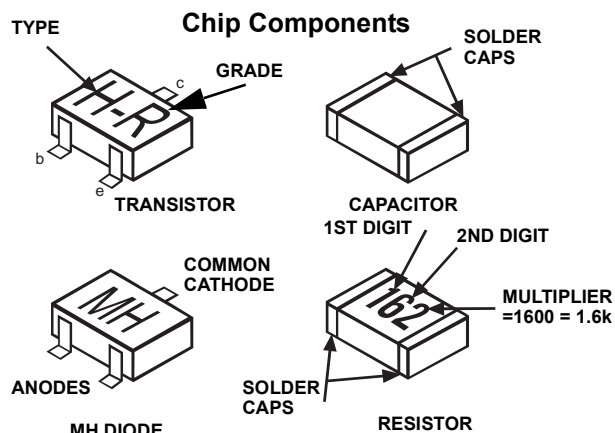
Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

Component Removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

Chip Component Installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

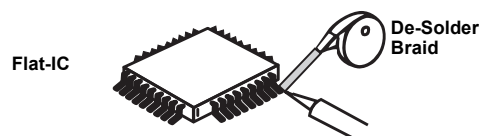


How to Replace Flat-IC

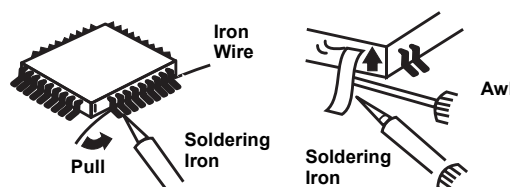
- Required Tools -

- Soldering iron
- De-solder braids
- Iron wire or small awl
- Magnifier

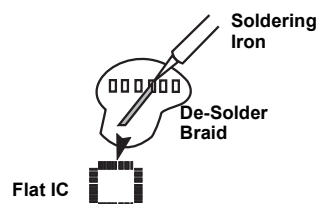
1. Remove the solder from all of the pins of a Flat-IC by using a de-solder braid.



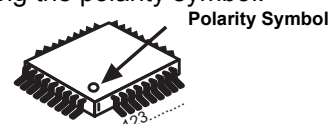
2. Put the iron wire under the pins of the Flat-IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.



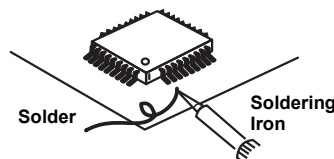
3. Remove the solder from all the pads of the Flat-IC by using a de-solder braid.



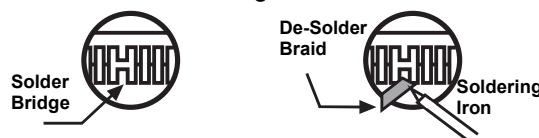
4. Position the new Flat-IC in place (apply the pins of the Flat-IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol.



5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



Service Notes (Continued)

IMPORTANT: To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CTR DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the Receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (⚡) or (↗) when servicing, or incorrect voltages will be measured.

WARNING: This Receiver has been designed to meet or exceed applicable safety and X-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol  on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

Horizontal Oscillator Disable Circuit

This chassis employs a special circuit to protect against excessive high voltage and beam current. If, for any reason, the high voltage and beam current exceed a predetermined level this protective circuit activates and detunes the horizontal oscillator that limits the high voltage. The over-voltage protection circuit is not adjustable. However, if components indicated by the symbol  on the schematic in either the horizontal sweep system or the over-voltage protection circuit itself are changed, the operation of the circuit should be checked using the following procedure:

Equipment needed to check the disabled circuit:

1. Voltmeter (0 - 200V scale)
2. High Voltage Meter (0- 50kV)
3. Variac or Isolation Transformer

Procedure:

1. Tune in a station to verify that the horizontal is in sync.
 2. Obtain a Monoscope pattern or a signal generator crosshatch pattern
 3. Connect the voltmeter (-) lead to TPD2 and the (+) lead to TPD1 (junction of D55b anode, R556 & R557). Set **Bright** level to (0) and **Picture** for a 1.8 volt reading on the voltmeter.
 4. Turn the Receiver OFF. Connect a jumper across IC803 pin 3 and pin 4. Apply +9V DC to cathode of D001.
 5. Reduce the AC supply voltage to approximately 45V. Connect the high voltage meter to the CRT anode. (H.V. button).
- Note:** Use the Dag Ground (C10 on the CRT Board) to connect the (-) lead of the meter.
6. Turn the Receiver ON. Slowly increase the AC supply voltage and verify that the high voltages does not exceed **37.1kV** when horizontal; just begins to pull out of sync. If the high voltage is not within the specified limit, the cause must be determined and corrected before the Receiver is returned to the customer.

Receiver Feature Table

FEATURE/MODEL	CT-27D10B/UB	CT-27D10DB
Chassis	NA8	NA8
Tuning system	96K	96K
# of channels	181	181
Menu language	Eng/Span/Fr	Eng/Span/Fr
Closed Caption	X	X
V-Chip	X	X
75 Ω input	X	X
Remote Model #	EUR511502	EUR511502
Picture tube	M68LGL061X	M68LGL061X
Black Face Regular Tube	X	X
Comb Filter	3 Line Digital	3 Line Digital
H. Edge Correction	X	X
V/A norm	X	X
Color Temp	X	X
MTS/SAP/DBX	X	X
BASS/BL/TRE Control	X	X
AI Sound	X	X
Surround	X	X
Built-in audio power	5Wx2 (10%)	5Wx2 (10%)
# of speakers	2	2
A/V in (rear/front)	3(2/1)	3(2/1)
S-VHS Input (rear/front)	1/0	1/0
Component Input (Y,Pb,Pr)	1	1
Audio Out (FAO: F, VAO: V)	F,V	F,V
Headphone Jack	Mini plug	Mini plug
Dimensions mm in (WxDxH)	665.2x544.5x594.8 26.2x21.5x23.5	665.2x544.5x594.8 26.2x21.5x23.5
Weight (kg/lbs)	35/77.2	35/77.2
Power source (V/Hz)	120/60	120/60
Anode voltage	28.30kV $\pm$ 1.25kV	28.30kV $\pm$ 1.25kV
Video input jack	1V _{p-p} 75 Ω , phono jack	1V _{p-p} 75 Ω , phono jack
Audio input jack	500mV RMS 47k Ω	500mV RMS 47k Ω
A-Board TNP2AH017	NIL	NIL
C-Board TNP2AA047	AP	AP

Table 1. Receiver Features

Specifications are subject to change without notice or obligation.
Dimensions and weights are approximate.

Location of Controls (Receiver)

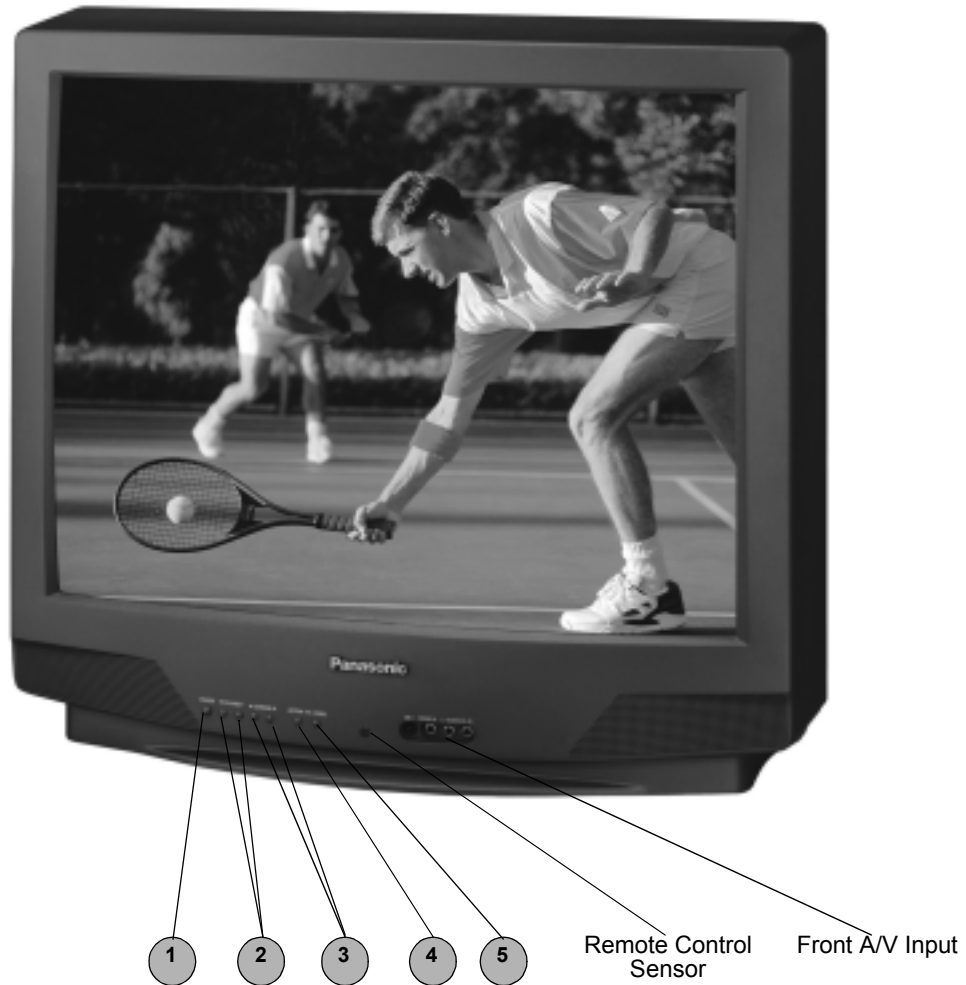


Figure 2. Location of Controls (Receiver).

Quick Reference Control Operation

Quick Reference Control Operation	
1	Power Button - Press to turn ON or OFF.
2	Volume Buttons - Press to adjust Sound Level, or to adjust Audio Menus, Video Menus, and select operating features when menus are displayed
3	Channel Buttons - Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select Cable Converter box channels after programming Remote Control Infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).
4	Action Button - Press to display Main Menu and access On Screen feature and Adjustment Menus.
5	TV/Video Button - Press to select TV or Video Input.

Location of Controls (Remote)

REMOTE CONTROL

POWER

Press to turn ON and OFF.

Presione para ENCENDER y APAGAR.

Appuyer pour établir ou couper le contact.

LIGHT

Press to light remote control buttons.

Presione para iluminar los botones del control remoto.

Appuyer pour éclairer les touches de la télécommande.

TV/VIDEO

Press to select TV or Video Mode.

Presione para seleccionar la Modalidad de Televisión ó Video.

Appuyer pour sélectionner le mode télé ou vidéo.

TV, VCR, DBS/CBL, DVD

Press to select remote operation.

Presione para seleccionar el funcionamiento del Control Remoto.

Appuyer pour sélectionner le fonctionnement télécommandé.

VOL

Press to adjust TV sound and navigate in menus.

Presione para ajustar el sonido de la Televisión y acceder opciones en los menús.

Appuyer pour régler le niveau sonore et se déplacer au sein des menus.

EXIT/GUIDE

DBS function buttons.

Botones de función DBS.

Touches de fonctions DBS.

MUTE

Press to mute sound. Press to access and cancel (CC) Closed Caption.

Presione para silenciar el sonido. También presione para activar y cancelar la Modalidad de Subtítulos (CC).

Appuyer pour couper le son. Appuyer pour mettre le décodeur de sous-titres (CC) en ou hors circuit.

CH

Press to select next channel and navigate in menus.

Presione para seleccionar el siguiente canal u opción en el menú.

Appuyer pour sélectionner le prochain canal et pour se déplacer au sein des menus.

ACTION

Press to access menus.

Presione para acceder los menús.

Appuyer pour accéder aux menus.

"0"~ "9"

Press numeric keypad to select any channel.

Presione el teclado numérico para seleccionar cualquier canal.

Appuyer sur une touche numérique du clavier pour sélectionner un canal.

RECALL

Press to display time, channel, sleep timer, and other options.

Presione para visualizar la Hora (Time), Canal (Channel), Cronómetro de Apagado Automático (Sleep Timer), y otras opciones.

Appuyer pour afficher l'heure, le numéro du canal, l'état de la minuterie-sommeil et d'autres options.

R-TUNE

Press to switch to previously viewed channel or video mode.

Presione para regresar al canal previamente visto.

Appuyer pour revenir au canal précédemment capté.

REW, PLAY, FF, TV/VCR, STOP, PAUSE, REC, VCR/DBS CHANNEL

Component function buttons.

Botones de función de los componentes.

Touches de fonctions d'appareil auxiliaire.



EUR511502

Figure 3. Location of Controls (Remote).

Disassembly for Service

Back Cover

Remove all the screws marked with an arrow() from the back of the Receiver.

Note: *Screw configuration, type, and number of screws vary depending on the model of the Receiver serviced and the application; various models are covered in this Manual. Use same hardware when reassembling the receiver.*

- 3 screws at the top edge of the Receiver.
- 1 screw at each lower corner of the Receiver.
- 1 screw by the AC cord assembly.
- 1 screw by the A/V jacks.
- 1 screw by the Fly-back assembly.

A-Board - Main Chassis

1. Slide the chassis completely out of the guide rails.
2. Stand the Receiver on its edge. The underside of the board is completely accessible for component replacement.

Note: *Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.*

C-Board - CRT Output

Plugs into the socket on the CRT neck.

Speakers

Speaker is secured to the cabinet's front with 4 screws.

Keyboard Push Button Assembly

Fastened to the inside of the cabinet front with up to 3 screws.

Disassembly for CRT Replacement

1. Discharge the CRT as instructed in the **Safety Precautions** (see page 2).
2. Disconnect the yoke (DY) plug, degaussing coil (DEG) plug and the CRT 2nd anode button from the main board.
3. Remove the C-Board from the CRT base and unplug the black wire (CRT dag ground) C10.
4. Disconnect the A11, A12, and Speakers plugs from the A-Board.
5. Lift the Main Chassis (A-Board) and all mounted boards completely out with the CRT Board attached.

CRT Replacement

1. Perform **Disassembly for CRT Replacement** procedure.
2. Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the **Safety Precautions** (see page 2) on handling the picture tube.
3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order for the CRT mounting hardware as they are remove from the CRT mounting brackets at each corner of the CRT.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.
6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.

To remove and re-mount the degaussing coil:

The degaussing coil is held in place by clampers fastened to the CRT corner ears. These clampers must be installed onto the replacement CRT prior to mounting the degaussing coil.

To remove and re-mount the dag ground braid:

a. Unhook the coil spring from the bottom corners of the CRT ears.

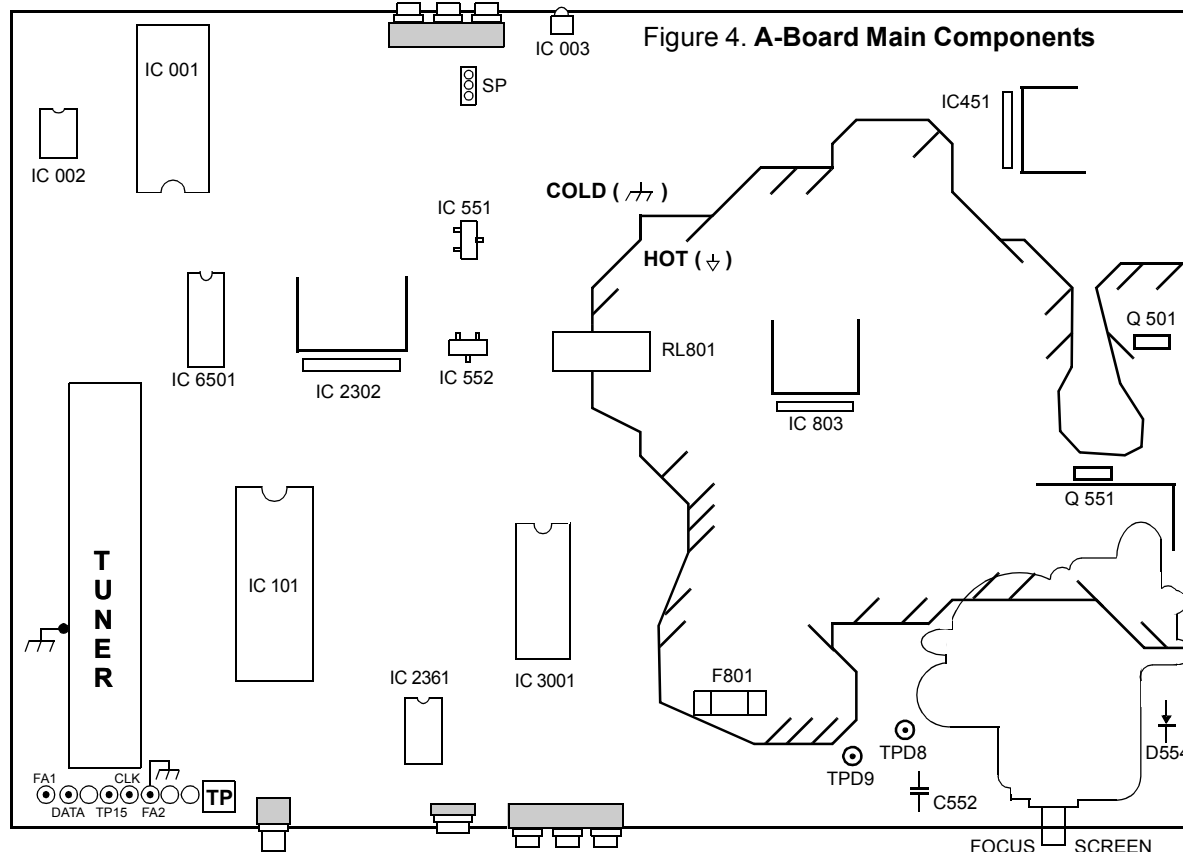
b. Release the braid loop from the upper corners of the CRT ears.

7. Mount the dag ground braid on the replacement CRT. Position the degaussing coil with new ties. Dress coil as was on the original CRT.
8. Replace the components on CRT neck and reinstall into cabinet. Verify that all ground wires and circuit board plugs get connected.

Chassis Service Adjustment Procedures

All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.

Note: Connect the (-) lead of the voltmeter to the appropriate ground. Use IC803's heat sink when the HOT ground symbol (∇) is used. Otherwise, use COLD ground (∇) — Tuner shield, IC451's heat sink or FA2.



MOMENTARILY CONNECT A JUMPER FOR ENTERING SERVICE MODE (FA1 to FA2)

131.0V B+ Voltage Confirmation

1. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu.
2. Connect the DVM between C809(+ side) and cold ground (∇).
3. Confirm that B+ voltage is **131.0V $\pm$ 2.5V**. This voltage supplies B+ to the Horizontal Output & Flyback circuits.

Source Voltage Chart

120V AC line input. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu. Use cold ground (∇) for the (-) lead of the DVM.

LOCATION	VOLTAGE
TPD8	27.4V $\pm$ 2V
TPD9	13.0V $\pm$ 2V
C552 (+) side	8.0V $\pm$ 1V
IC551 Pin3	9.0V $\pm$ 0.5V
D554 Cathode	220V $\pm$ 15V
C572 (+) side	5.0V $\pm$ 0.25V

Adjust Picture Menu for normalized video adjustments.

High Voltage Check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust Brightness and Picture using Picture Icon menu so video just disappears.
3. Confirm B+ 131V is within limit.
4. Using a high voltage meter confirm that the High Voltage is **28.30kV $\pm$ 1.25kV**.

Purity and Convergence Procedure

Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

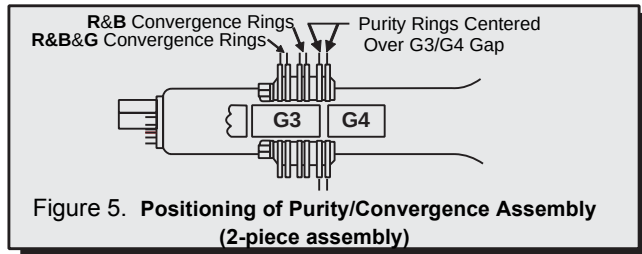
1. Vertical Raster Shift Adjustment. (**Only for Models with Purity/Convergence Assembly with 4 Pairs of Rings**).
2. Initial static convergence.
3. Setting the purity.
4. Final static convergence.

When the CRT or the Yoke is Replaced

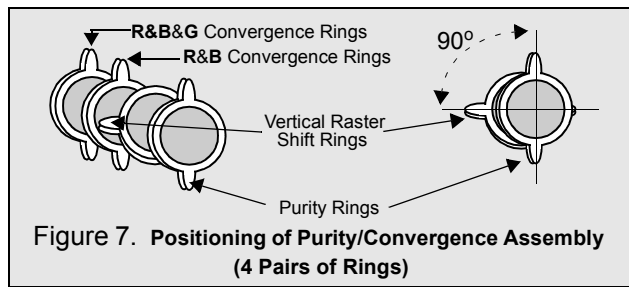
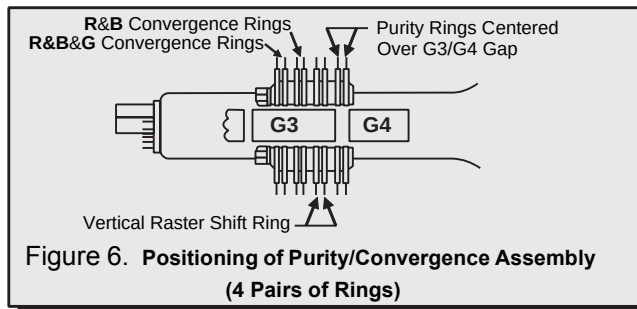
Place the yoke on the CRT neck (do not tighten the clamp).

For a 2-piece assembly (see Fig. 5):

Position purity/convergence assembly as shown and tighten clamp snugly. Remove the hot-melt glue seal on assembly and position like tabs of purity device together at 12 o'clock to reduce its magnetic field effect.

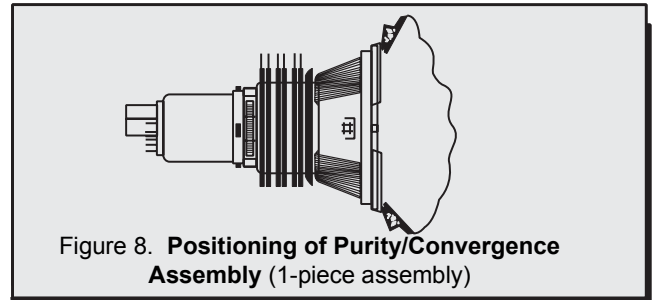


For models using 4 pairs of rings, place the vertical raster shift tabs at 3 o'clock (90° from the purity and convergence tabs, see Fig. 6 and Fig. 7)



For a 1-piece assembly (see Fig. 8):

Position like tabs of purity devices together at 12 o'clock to reduce any magnetic field effect. (For better results, note part number and look for specifications at Service Center)



For either assemblies:

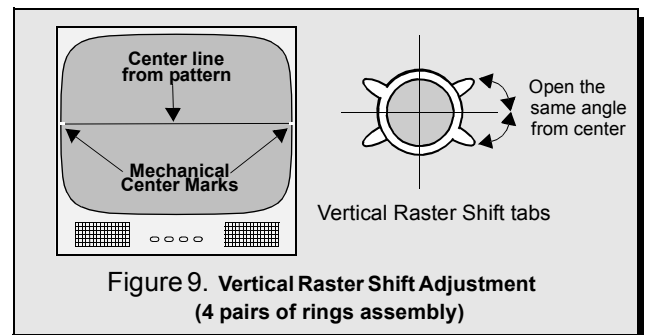
Turn the Receiver ON. Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT.

Fully degauss the Receiver by using an external degaussing coil.

Slide the deflection yoke back and forth on the neck of the CRT until it produces a near white, uniform raster.

Vertical Raster Shift Adjustment (Only for Models with Purity/Convergence Assembly with 4 Pairs of Rings).

Apply a green pattern with a horizontal line, adjust the Deflection Yoke so that has no tilt, then secure it. Adjust center line of the pattern with the mechanical center of the CRT, this center is determined by two marks at the side edges of the screen. To adjust the line, once the vertical raster shift tabs are place at 3 o'clock to reduce its magnetic field effect (see Fig. 6 and Fig. 7) open the tabs the same angle from the center, until the center line of the pattern becomes a straight line, centered with the marks of the CRT. (see Fig. 9)



Initial Center Static Convergence

Connect a dot/cross hatch generator to the Receiver and tune in a signal. Observe misconvergence at center of the screen only.

Adjust the R&B pole magnets; by separating tabs and rotating to converge blue with red.

Adjust the R&B and R&B&G pole magnets: by separating tabs and rotating to converge blue and red (magenta) with green.

Note: Precise convergence at this point is not important.

Purity Adjustment

When the Receiver is in the Serviceman Mode for making electronic adjustments, press the **Recall** button on the Remote Control to enter Purity Check. (See the **Service Adjustments Electronic Controls** procedure).

Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT.

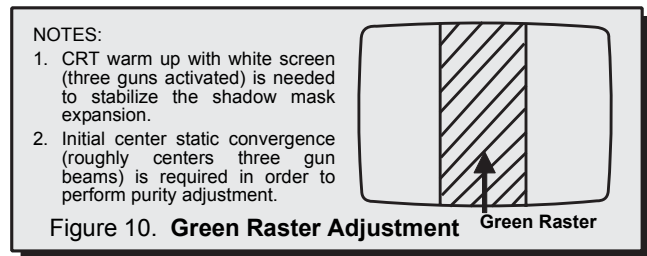
Fully degauss the Receiver by using an external degaussing coil.

Press the **Recall** button on the Remote Control again until the Purity Check (green screen) appears.

For a 2-piece assembly (see Fig. 5):

Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

Adjust the Purity rings to set the vertical green raster precisely at the center of the screen (see Fig. 10).



Slowly move the deflection yoke forward until the best overall green screen is displayed.

For a 1-piece assembly (see Fig. 8):

Slowly move the deflection yoke and purity rings assembly toward the CRT board and adjust the purity magnet rings to set vertical green raster at center of screen (see Fig. 10).

Gradually move the deflection yoke & purity rings forward and adjust for best overall green screen.

Continue from here for either assemblies:

Tighten the deflection yoke clamp screw.

Press the **Recall** button on the Remote Control again until the purity check (blue screen) and (red screen) appear and observe that good purity is obtained on each respective field.

Press the **Recall** button on the Remote Control again until Purity check (white screen) appears. Observe the screen for uniform white. If purity has not been achieved, repeat the above procedure.

Final Convergence Procedure (see Fig. 11 through Fig. 13):

Note: Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the Receiver. The **Brightness** level should not be higher than necessary to obtain a clear pattern.

Converge the red and the blue dots at the center of the screen by rotating the R&B pole Static Convergence Magnets.

Align The converged red/blue dots with the green dots at the center of the screen by rotating the R&B&G pole Static Convergence Magnets. Melt wax with soldering iron to reseal the magnets.

Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence.

If convergence is not reached at the edges, insert permalloy (see following section) from the DY corners to achieve proper convergence. Recheck for purity and readjust if necessary.

After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.

Secure the deflection yoke by inserting two side wedges at 3 and 7 o'clock positions.

Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

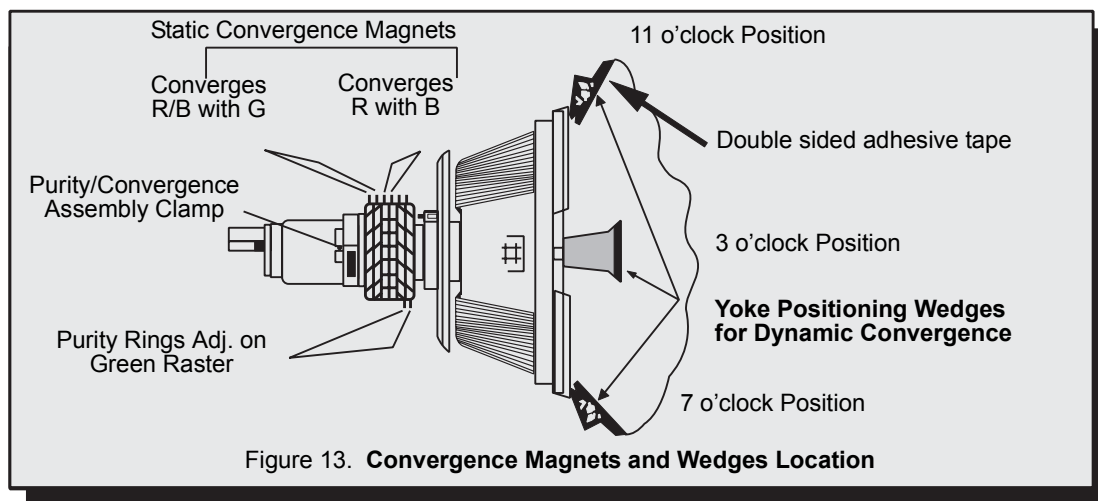
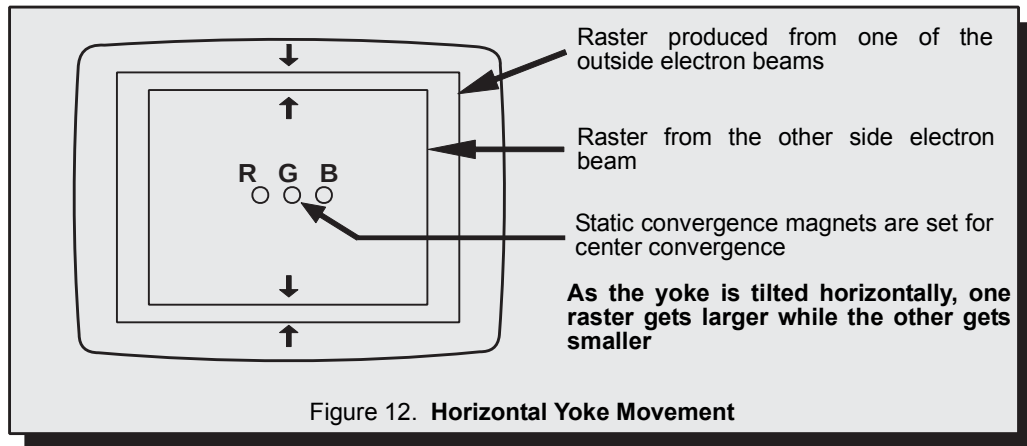
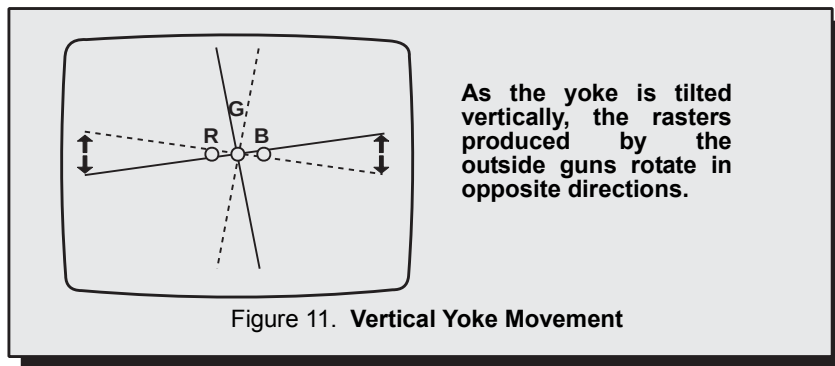
Permalloy Convergence Corrector Strip (Part No. 0FMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.

First converge the set without the strip and observe the corners.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.



Note: For models using 4 pairs of rings assemblies see Fig. 6 for details

Serviceman Mode (Electronic Controls)

This Receiver has electronic technology using the I²C Bus Concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using "On Screen Display Menu". (The **Serviceman Adjustment Mode**.)

Note: *It is suggested that the technician reads all the way through and understand the following procedure for Entering/Exiting the **Serviceman Adjustment Mode**; then proceed with the instructions working with the Receiver. When becoming familiar with the procedure, the Flow Chart for Serviceman Mode may be used as a quick guide.*

Quick Entry to Serviceman Mode:

At times when minor adjustments need to be done to the electronic controls, the method of Entering the serviceman Mode without removal of the cabinet back is as follows using the Remote Control:

1. Select SET-UP icon and select CABLE mode.
2. Select TIMER icon and set SLEEP time for 30 Min.
3. Press ACTION button 3 times to exit menus.
4. Tune to the Channel 124.
5. Adjust VOLUME to minimum (0).
6. Press the VOL ◀ button (decrease) **on Receiver**. Red "CHK" appears in upper corner.

To toggle between Aging and Serviceman modes:

While the "CHK" is displayed on the left top corner of the CRT, pressing the Action and the Volume Up buttons on the Receiver simultaneously will toggle between the modes. Red "CHK" for Serviceman and yellow "CHK" for Aging.

7. **Press the Power Button on the Remote Control** to select one of seven Serviceman Adjustment Modes.
 - 1) **B**= Serviceman VCJ SUB-DATA ADJUSTMENT.
 - 2) **C**= Serviceman VCJ CUT-OFF ADJUSTMENT.
 - 3) **D**= Serviceman PIN CUSHION ADJUSTMENT.
 - 4) **M**= Serviceman MTS ADJUSTMENTS.
 - 5) **P**= Serviceman PIP ADJUSTMENT. (*Models with PIP only*)
 - 6) **S**= Serviceman OPTIONS ADJUSTMENTS.
 - 7) **X** = Serviceman COMB FILTER ADJUSTMENT.
 - 8) **"CHK"** = Normal operation of CHANNEL ▲▼ and VOLUME ◀▶.

Note: *Only the applicable settings for the Receiver serviced will be available (See a in Fig. 14).*

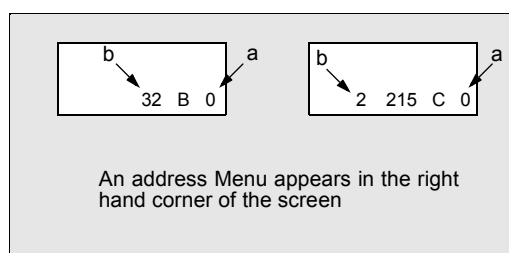


Figure 14. **Serviceman Mode Menu Adjustments.**

Exiting the Serviceman Mode:

Press the **Action** and the **Power** buttons on the **Receiver** simultaneously for at least 2 seconds.

THE RECEIVER EXITS SERVICEMAN MODE.

The Receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound. Any programmed channels, channels caption data and some others user defined settings will be erased.

IMPORTANT NOTE:
Always Exit the Serviceman Mode
Following Adjustments.

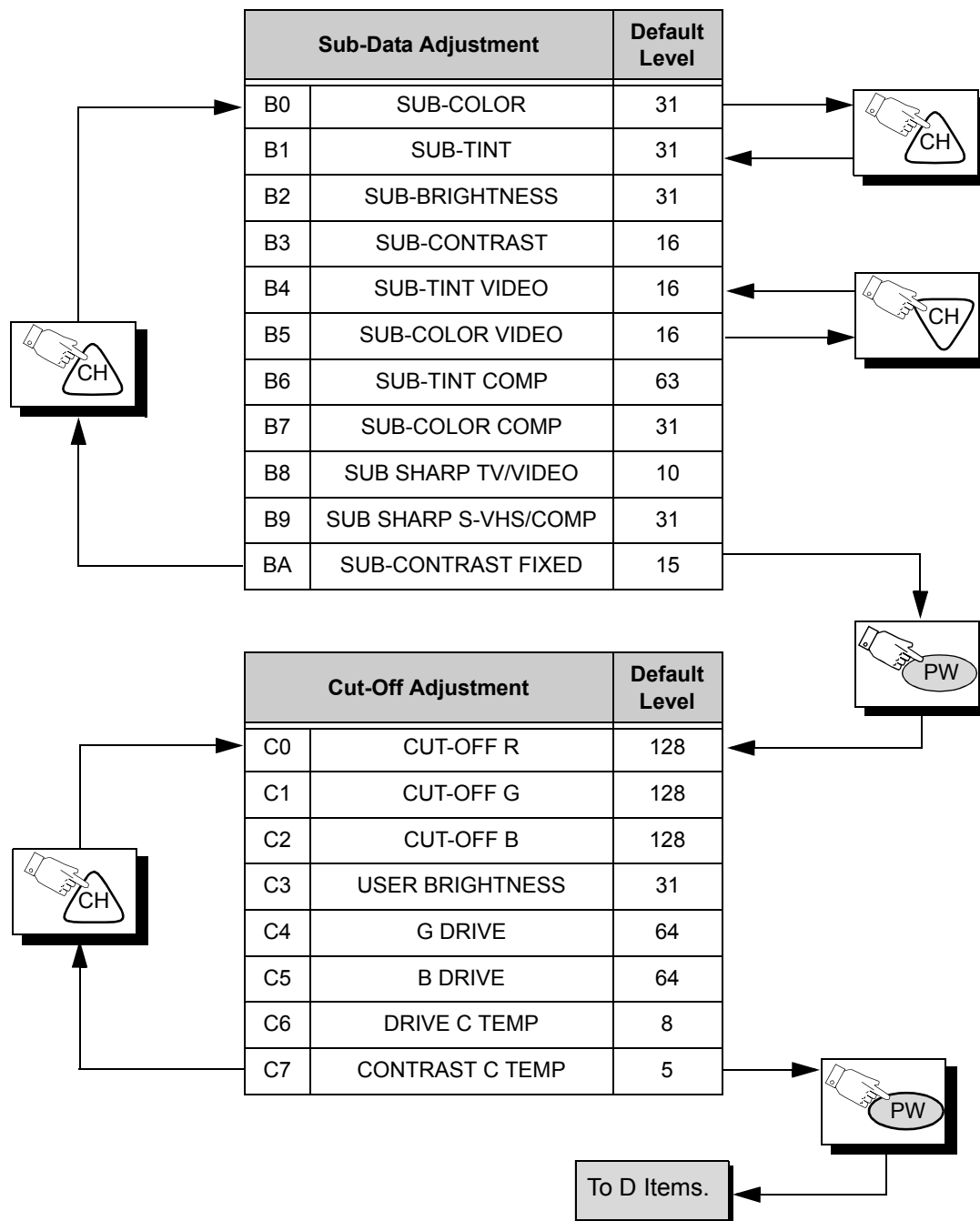
Press the **Power Button** on the **Remote Control** to select the Serviceman Adjustment .

For Adjustments:

1. Press **Channel Up/Down** on the **Remote Control** to select one of the available Service Adjustments (a in Fig. 14).

Note: Write Down the original value set (b in Fig. 14) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press **Volume Up/Down** on the **Remote Control** to adjust the level of the selected Service Adjustment (b in Fig. 14).

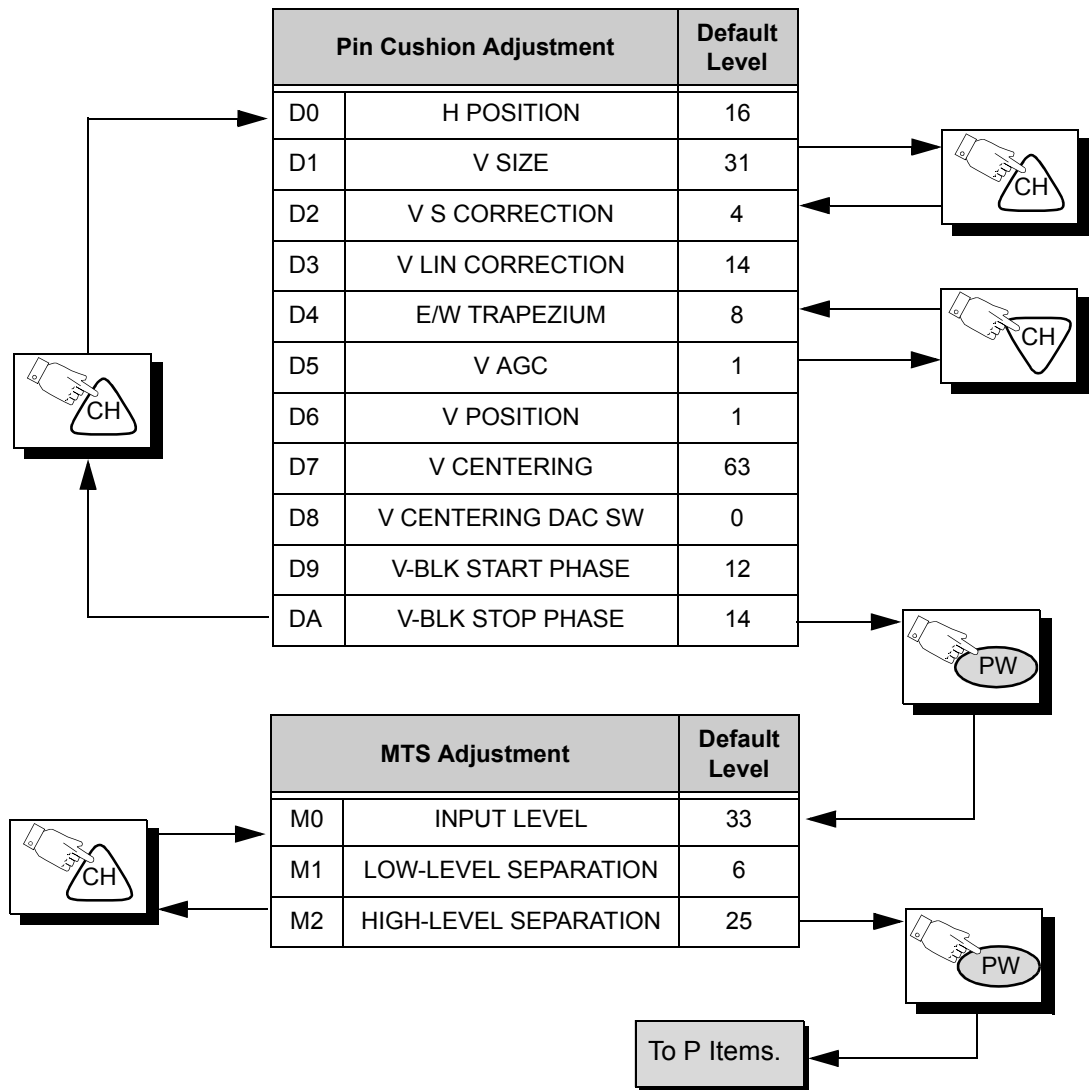


IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

Press the Power Button on the Remote Control to select the Serviceman Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 14).
- Note:** Write Down the original value set (b in Fig. 14) for each address before modifying anything. It is easy to erroneously adjust the wrong item.
2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 14).



Note: Some adjustments modes may not be available in some models depending on available options.

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

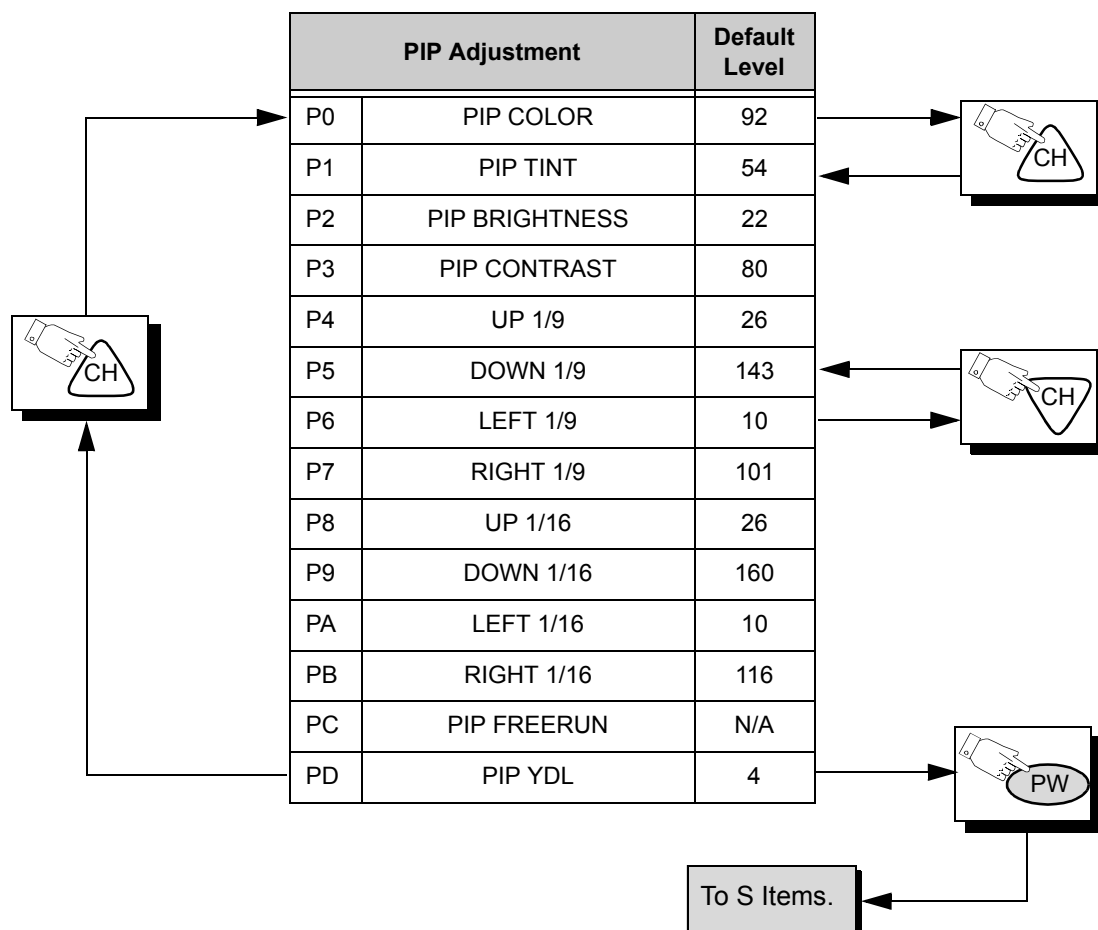
Press the Power Button on the Remote Control to select the Serviceman Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 14).

Note: Write Down the original value set (b in Fig. 14) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 14).



Note: Some adjustments modes may not be available in some models depending on available options.

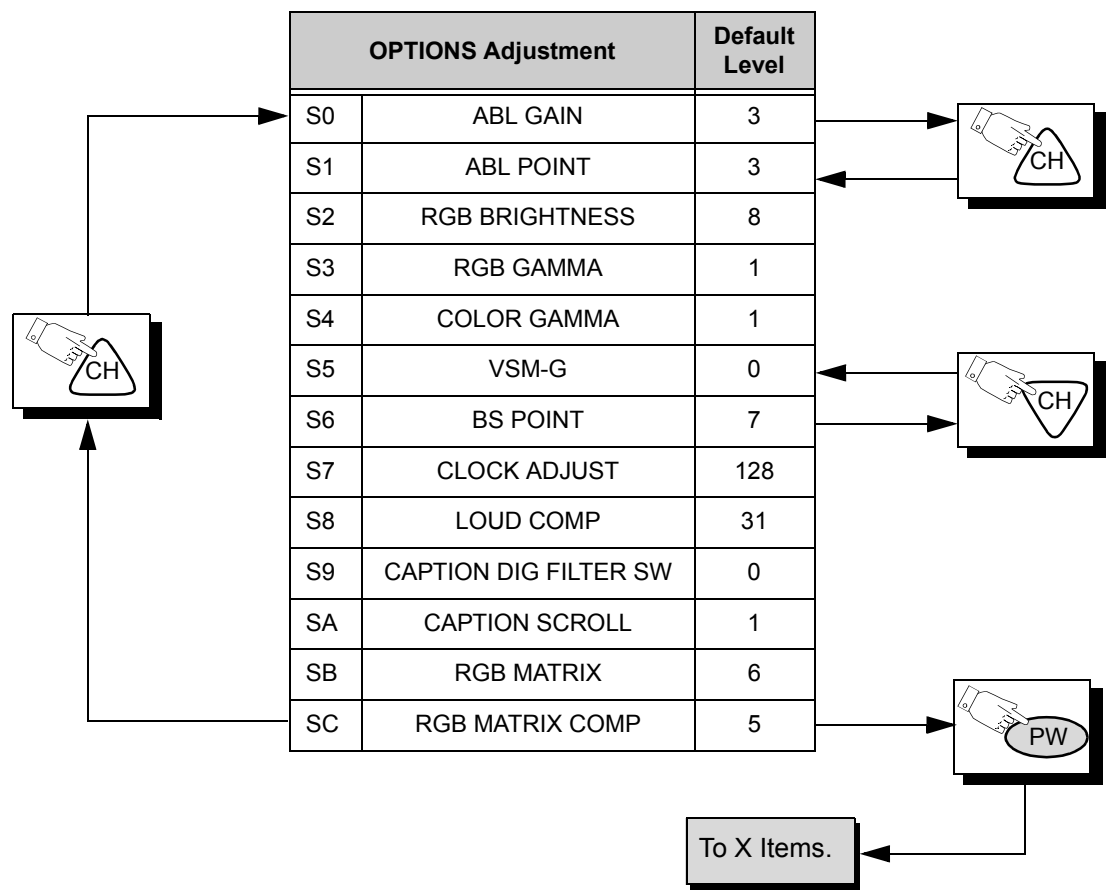
IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

Press the Power Button on the Remote Control to select the Serviceman Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 14).

Note: Write Down the original value set (b in Fig. 14) for each address before modifying anything. It is easy to erroneously adjust the wrong item.
2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 14).



Note: Some adjustments modes may not be available in some models depending on available options.

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

Press the Power Button on the Remote Control to select the Serviceman Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 14).

Note: Write Down the original value set (**b** in Fig. 14) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 14).

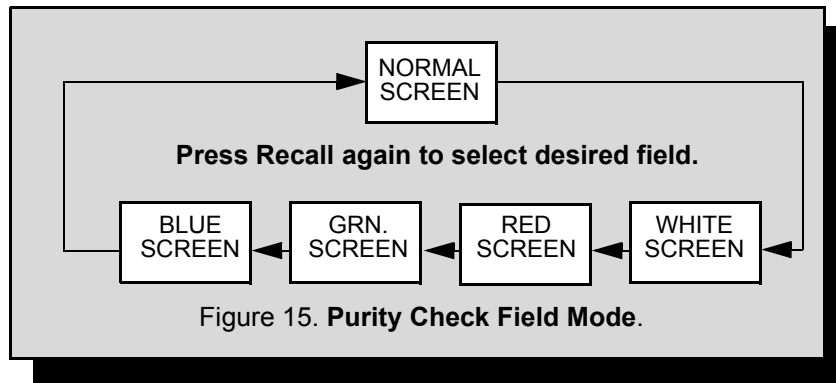
Comb Filter Adjustment		Default Level
X0	CLIP LEVEL	152
X1	CSOK	12
X2	COMB LIMIT	24
X3	COMB CORE	41
X4	COMB RF DELAY	20
X5	COMB VIDEO DELAY	18
X6	COMB VMLM	90
X7	COMB VMCO	24
X8	COMB SHARP	123
X9	COMB VM LEVEL	255
XA	COMB VMPKF	1
XB	H LOCK MODE	1
XC	H LOCK	70
XD	H SEP 1	313
XE	H SEP 2	266
XF	SUB H LOCK MODE	0
X10	SUB H LOCK	70
X11	SUB H SEP1	313
X12	SUB H SEP2	266

Note: Some adjustments modes may not be available in some models depending on available options.

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

To Check Purity:

Press the **Recall** Button on the **Remote Control** when in Serviceman Mode (red “CHK” is displayed) to enter the Purity Field Check Mode.



Helpful Hints

Entering Serviceman Mode (Back-Open Method)

1. While the Receiver is ON and operating in Normal Mode, momentarily short test point **FA1** (TP8) to Cold Ground ($\nearrow$) **FA2** (TP3) A-Board.

The Receiver enters the Aging Mode.

Yellow letters “CHK” appear in the upper left corner of the CRT.
(The Volume Up/Down will adjust rapidly).

2. Simultaneously press the **Action** and the **Volume Up** buttons on the **Receiver** Control Panel.

The Receiver enters the Serviceman Mode.

The letter in “CHK” turn red.
(The Volume Up/Down will adjust normally).
(All customer controls are set to nominal level).

IMPORTANT NOTE:
Always Exit the Serviceman
Mode Following Adjustments.

Instructional Flow Chart for Serviceman Mode

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

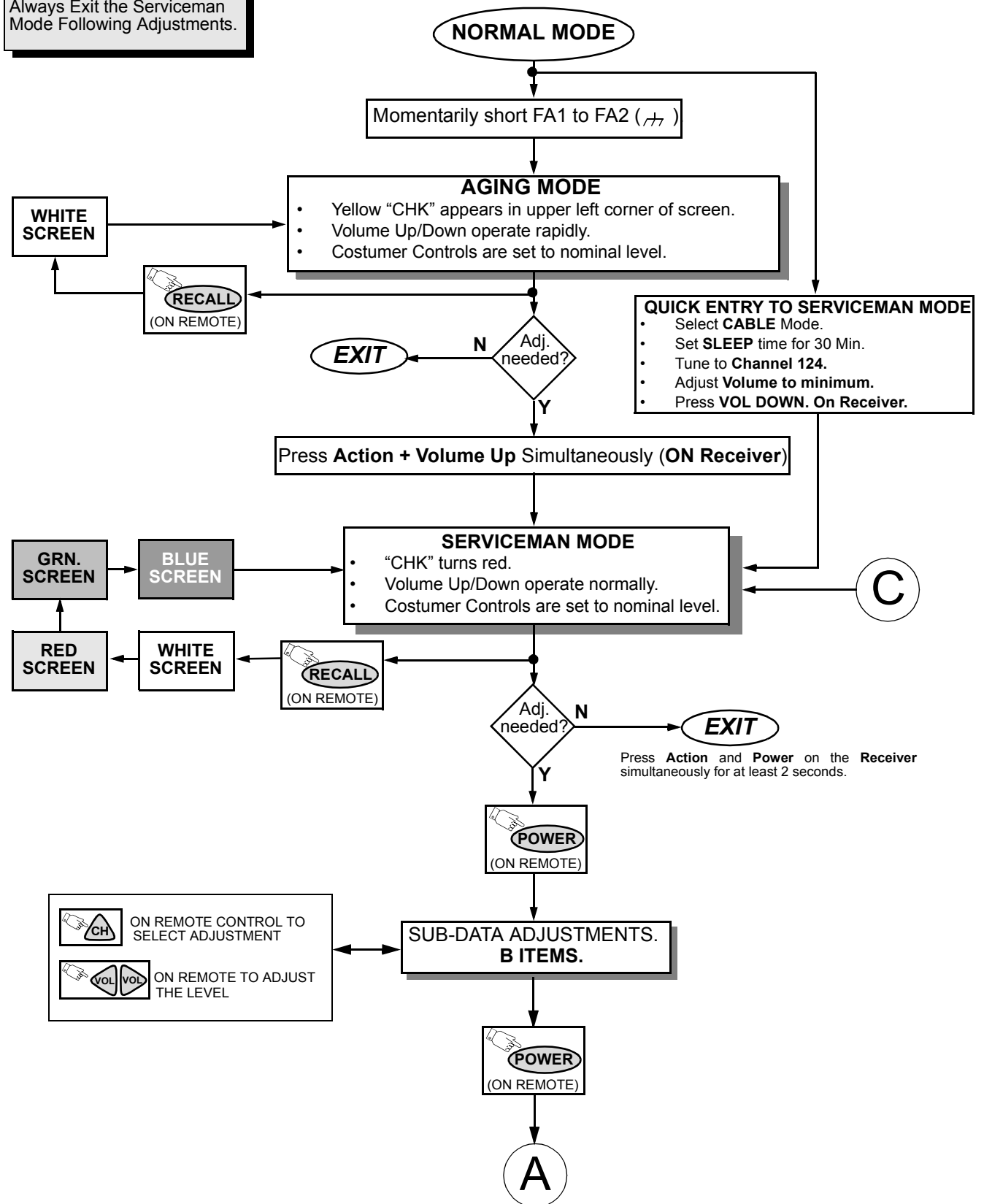


Figure 16. Flow Chart for Serviceman Mode.

Instructional Flow Chart for Serviceman Mode - Continued

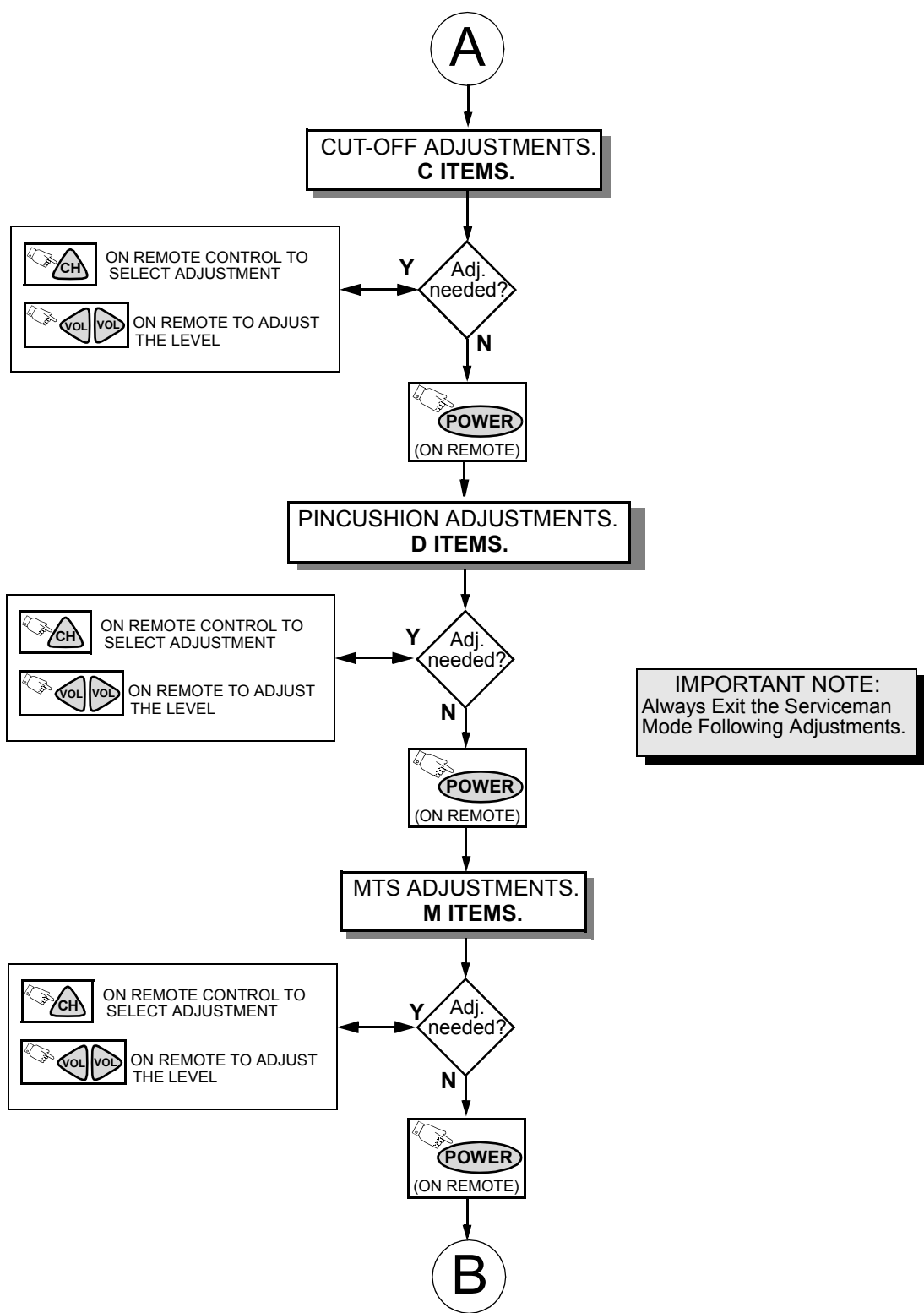
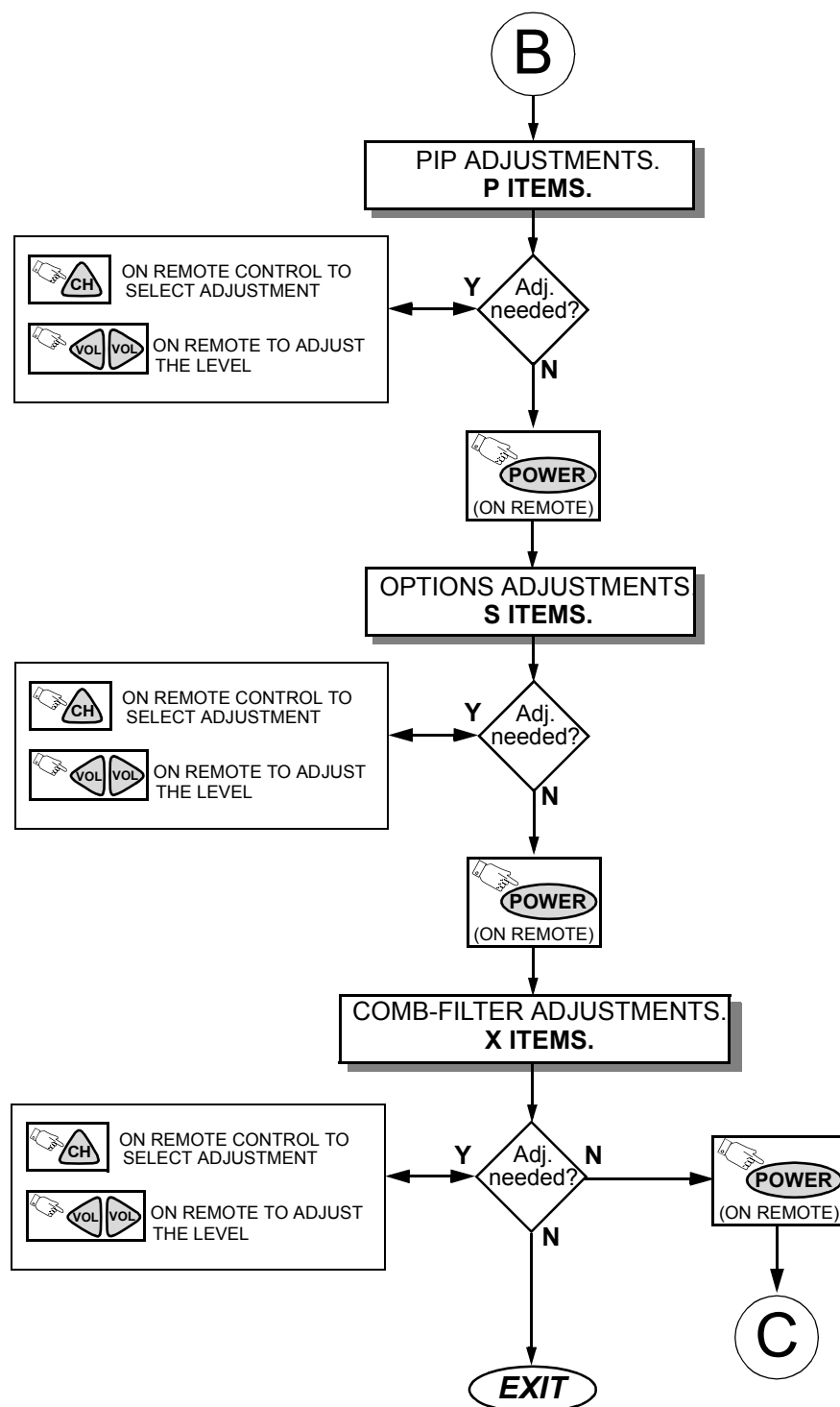


Figure 17. Flow Chart for Serviceman Mode (cont).

Instructional Flow Chart for Serviceman Mode - Continued



Press **Action** and **Power** on the **Receiver** simultaneously for at least 2 seconds.

Figure 18. Flow Chart for Serviceman Mode (cont).

Note: Some adjustments modes may not be available in some models depending on available options.

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

Service Adjustments (Electronic Controls)

Sub-Brightness

Serviceman DAC Adjustment (B2)

Adjustment of this control is important for setting proper operation of customer brightness and picture controls. This adjustment must be made after Sub-Contrast or Color Temperature adjustments are made. **Do not adjust SCREEN** after the Sub-Brightness is set.

Preparation:

Apply a color bar signal with 100 IRE white and 7.5 IRE black. (Switch Color to "OFF" on the signal generator.) Operate the Receiver for a minimum of 10 minutes prior to performing this adjustment.

Procedure:

In the Serviceman Mode for making electronic adjustments, select the DAC adjustment (B2) and adjust until the black starts to look gray. Then decrease the level to the point where gray turns to black.

Note: You may set the accurate value following the Preparation steps and the Procedure step No. 2 of the Sub-Contrast adjustment described below.

Sub-Contrast

Serviceman DAC Adjustment (B3)

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

Preparation:

1. Apply a color bar signal pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black.

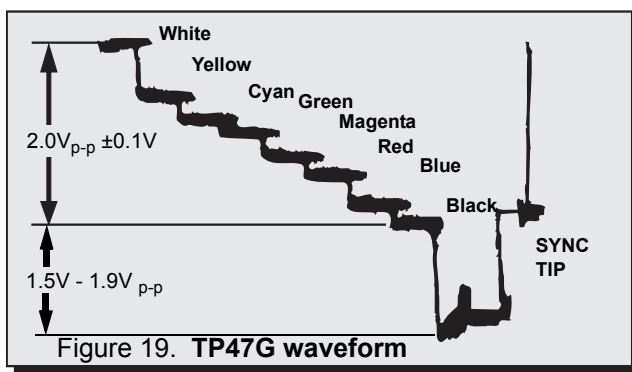
Note: The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to the pattern used if another signal is used.

2. Preset the following controls:

- Brightness Center.
- Color Min.
- Picture Max.
- Sharpness Center.

3. Connect the oscilloscope to TP47R. Set the scope time base to 20 μ s (horizontal).

4. Connect a jumper from TPD2 to ground ($\nearrow$)..



Procedure:

1. In the Serviceman Mode, select DAC Sub-Brightness Adjustment (B2) and adjust for **1.5-1.9Vp-p** between blanking and 7.5 IRE level. (See video waveforms detail, Fig. 19)
2. In the Serviceman Mode for electronic adjustments, select DAC Sub-Contrast Adjustment (B3) and adjust for **2.0Vp-p ± 0.1V** white level to black level on video waveform (see video waveforms detail, Fig. 19).
3. Remove the jumper (Preparation step 4).

Tint/Color Adjustment

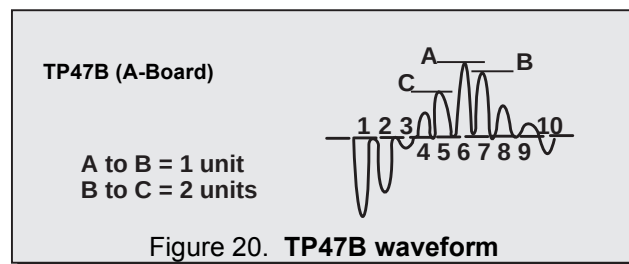
Serviceman DAC Adjustment (B1) (B0)

Preparation:

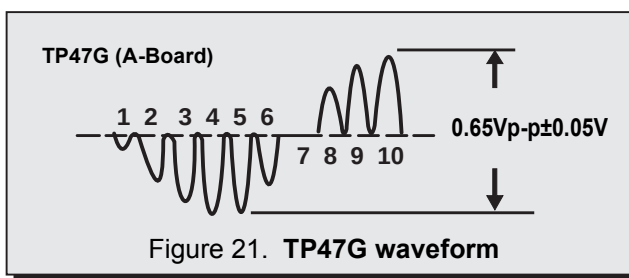
1. Apply a rainbow color bar signal.
2. Preset the following controls:
 - Brightness Min.
 - Color Center.
 - Tint Center.
 - Picture Max.
 - Sharpness Min.
3. Connect the oscilloscope to TP47B (A-Board).
4. Connect a jumper from TPD2 to GND ($\nearrow$).
5. Change the value of DAC S3 from 1 to 0.

Procedure:

1. In the Serviceman Mode for making electronic adjustments, select DAC Sub-Tint Adjustment (B1). Adjust until the waveform measured is as the one shown in Fig. 20.



2. Connect the oscilloscope to TP47G (A-Board).
3. Select DAC Sub-Color Adjustment (B0) and adjust for peak to peak amplitude to be **0.65Vp-p ± 0.05V** for 27" models as shown in Fig. 21.



4. Remove the jumpers (Preparation steps 4 & 5).

Service Adjustments (Electronic Controls, cont.)

Color Temperature Adjustment (B/W Tracking)

Serviceman DAC Adjust. (C0) (C1) (C2) (C4) (C5) Minor Touch-Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good gray scale and warm highlights".

1. LOW LIGHT areas – In Serviceman Mode for making electronic adjustments, select Cutoff (C0) RED, (C1) GRN, (C2) BLU and adjust the picture for gray.
2. HIGH LIGHT areas – In Serviceman Mode for making electronic adjustments, select Drive (C4) GRN, (C5) BLU and adjust the picture for warm whites.

Complete Adjustment

Preparation:

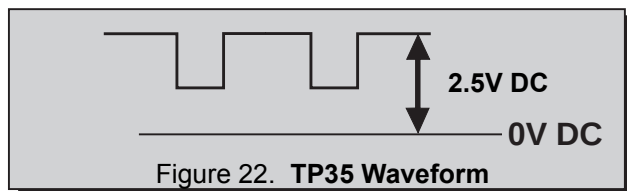
1. Turn the Receiver "ON" and allow 10 minutes warm up at high brightness.
2. Apply a color bar signal with color "OFF".
3. Turn the SCREEN control (part of FBT T551) fully counterclockwise.

Procedure:

Preset the following Serviceman DACs for best results:

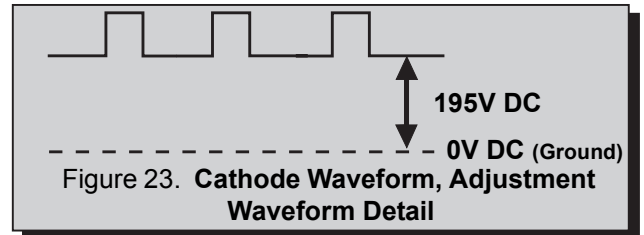
- C0 128
- C1 128
- C2 128
- C4 64
- C5 64

1. Connect the oscilloscope to C1-1 (CRT-Board).
2. In Serviceman Mode for making electronic adjustment, select the Sub-Bright DAC (B2).
3. Press the R-Tune key on the remote.
4. Observe the oscilloscope waveform at Horizontal rate and adjust the Serviceman Mode Sub-Bright DAC (B2) level until a scanning period of **2.5V** above DC ground is measured, as indicated in Fig. 22.



5. Connect the scope to RED Cathode (KR) on the CRT-Board.
6. In the Serviceman Mode for making electronic adjustments, select the RED CUTOFF DAC (C0).
7. Press the R-Tune key on the remote.

8. View scope trace at Horizontal rate and adjust the Serviceman Mode DAC (C0) level until a scanning period of **195V** above DC ground is measured, as indicated in Fig. 23.
9. Connect the scope to the GRN Cathode (KG).
10. In Serviceman Mode for making electronic adjustments, select the GRN CUTOFF DAC (C1).
11. Press the R-Tune key on the Remote



12. View the scope trace and adjust the Serviceman Mode DAC (C1) for the scanning period to be **195V** above DC ground. (See Fig. 23)
13. Connect the scope to the BLU Cathode (KB).
14. In Serviceman Mode for making electronic adjustments, select the BLU CUTOFF (C2).
15. Press the R-Tune key on the Remote.
16. View the scope trace and adjust the Serviceman Mode DAC (C2) for the scanning period to be **195V** above DC ground. (See Fig. 23)
17. Turn the Screen Control (part of FBT) slowly clockwise until a color horizontal line appears.
18. With the other two colors Serviceman Mode DAC CUTOFF adjustments (C0) RED, (C2) BLU; increase the colors to create a white horizontal line.
19. Confirm that a good gray scale is established by viewing B/W color bar pattern.
20. In the Serviceman Mode for making electronic adjustments select the DAC DRIVE adjustments (C4) GRN, (C5) BLUE and adjust for warm white in a white color bar pattern.
21. EXIT the Serviceman Mode.
22. Adjust the Picture Menu Video Adjustments **Bright** and **Picture** from low scale to high scale and check Black and White tracking.
23. If correction is needed: Re-Enter the Serviceman Mode and perform the **Minor Touch – Up Method**.
24. Perform **Sub-Brightness** Adjustment procedure if needed.

Service Adjustments (Electronic Controls, cont.)

Horizontal Centering

Serviceman DAC Adjustment (D0)

Preparation:

Connect a monoscope pattern generator.

Procedure:

1. In the Serviceman Mode for making electronic adjustments. Select the Horizontal Centering Adjustment DAC (D0) and adjust until the center of the monoscope pattern is centered on CRT.
2. EXIT the Serviceman Adjustment Mode.

MTS Circuit Adjustments

The MTS Circuit Adjustments require two steps:

1. Input Level Adjustment.
2. Stereo Separation Adjustment.

Input Level Adjustment (M0)

Preparation:

1. Connect an RMS meter with filter jig as shown in Fig. 24.

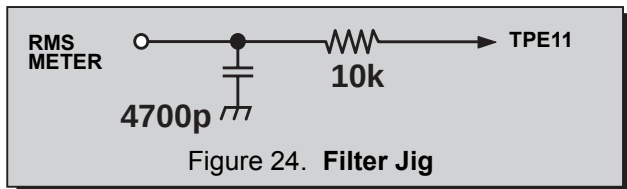


Figure 24. Filter Jig

2. Connect an RF signal generator to the RF antenna input.

Procedure:

1. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 300Hz, 100% modulation, monaural (70 $\pm$ 5dB, 75 Ω OPEN, P/S 10dB).
2. Adjust the MTS Input Level Adjustment (M0) until the voltage measured is 106 $\pm$ 6.0mV rms.

Stereo Separation Adjustment (M1 & M2)

Preparation:

1. Connect an RF signal generator to the RF antenna input.
2. Connect a scope to TPE10.

Procedure:

1. Select Stereo Mode in Audio menu
2. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 300Hz, 100% modulation, stereo (left only) (70 $\pm$ 5dB, 75 Ω OPEN, P/S 10dB).
3. Adjust the MTS Low-Level Separation Adjustment (M1) until the amplitude displayed on the scope is minimum.
4. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 3KHz, 100% modulation, stereo (left only) (70 $\pm$ 5dB, 75 Ω OPEN, P/S 10dB).
5. Adjust the MTS High-Level Separation Adjustment (M2) until the amplitude displayed on the scope is minimum.
6. Repeat above steps 2 through 5 until the amplitude is at minimum for both signals.

Service Adjustments (Electronic Controls, cont.)

Clock Adjustment (S7)

Preparation:

Connect the frequency counter from TPS1 (IC001 Pin 13) to cold ground ($\rightarrow$).

Note: *Frequency Counter probe capacitance should be 8pF or less.*

Procedure:

1. Turn the Receiver "OFF" with the AC power applied.
2. Measure TPS1 (IC001 pin 13) for the frequency of the waveform and record the reading.

Note: *Pin 13 measurement must have at least four digits of resolution following the decimal point. Example: 000.0000*

3. Turn the Receiver back "ON".
4. Place the Receiver into Serviceman Mode for making electronic adjustment, select the Clock Adjustment DAC (S7).

5. Calculate and set Sb based on the following formula:

$$Sb = 128 + 0.901 \times 10^6 \frac{244.1406 - pin13[Hz]}{244.1406}$$

Note: *Pin 13 measurement will not change regardless of the value stored in Sb.*

Vertical Size (D1)

1. Adjust the VERTICAL SIZE DAC control, D1, until the top and the bottom edges of the raster are visible.
2. Adjust the VERTICAL SIZE control, D1, until the top and the bottom of the raster touch the bezel edge. The advance SIZE control to obtain an approximately 10% overscan. Linearity adjustment is don automatically when the size is being adjusted. (Best results can be obtained with a round test patter.)

Service Adjustments (Mechanical Controls)

Focus (part of T551)

Preparation:

Connect a Signal generator and select a dot pattern.

Procedure:

Adjust the FOCUS control to obtain the sharpest and clearest dot pattern.

- a. Adjust for best center.
- b. Adjust for best area between the center and top right corner.

Audio Signal Path Block Diagram

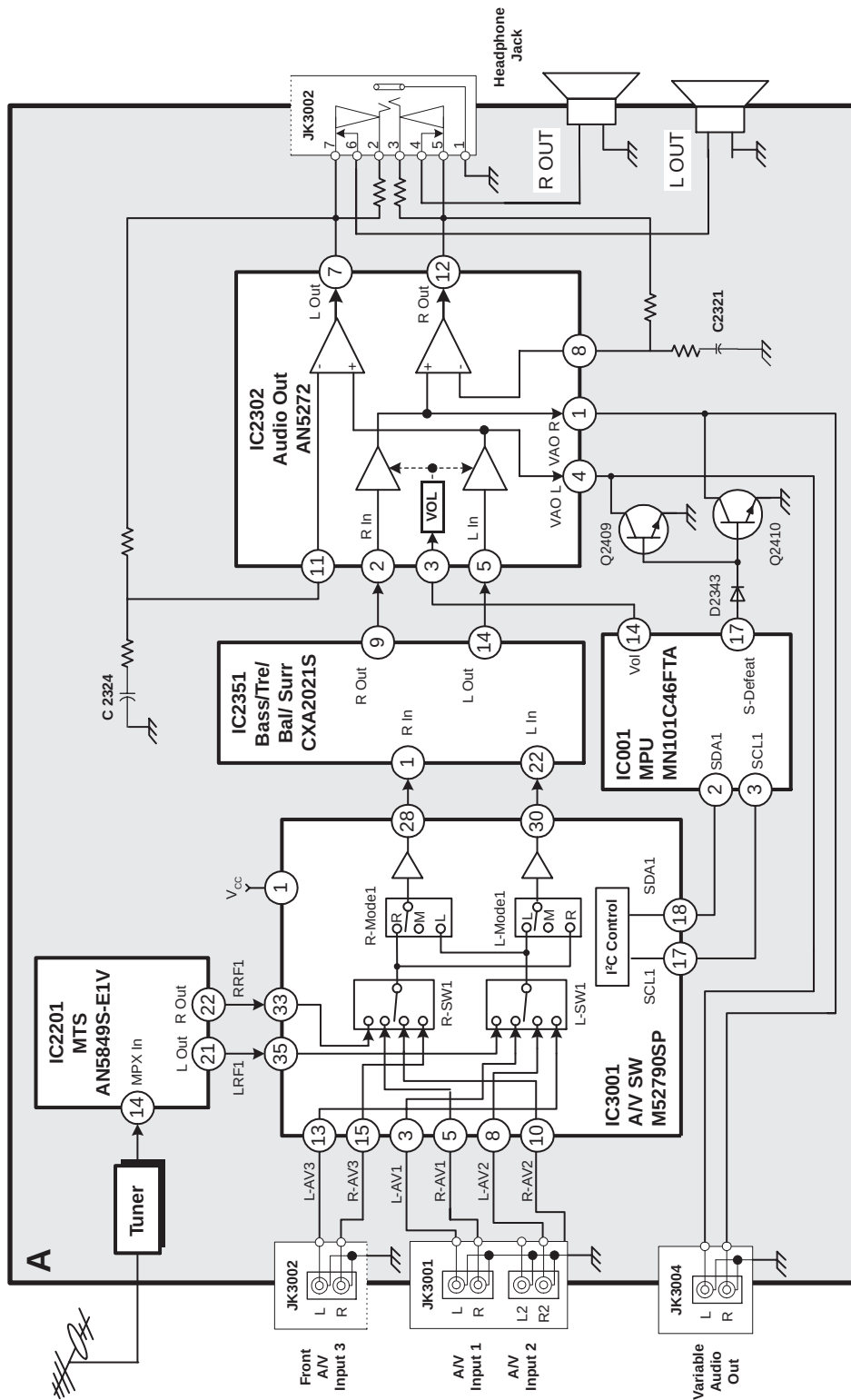


Figure 25. Audio Signal Path Block Diagram.

Video Signal Path Block Diagram

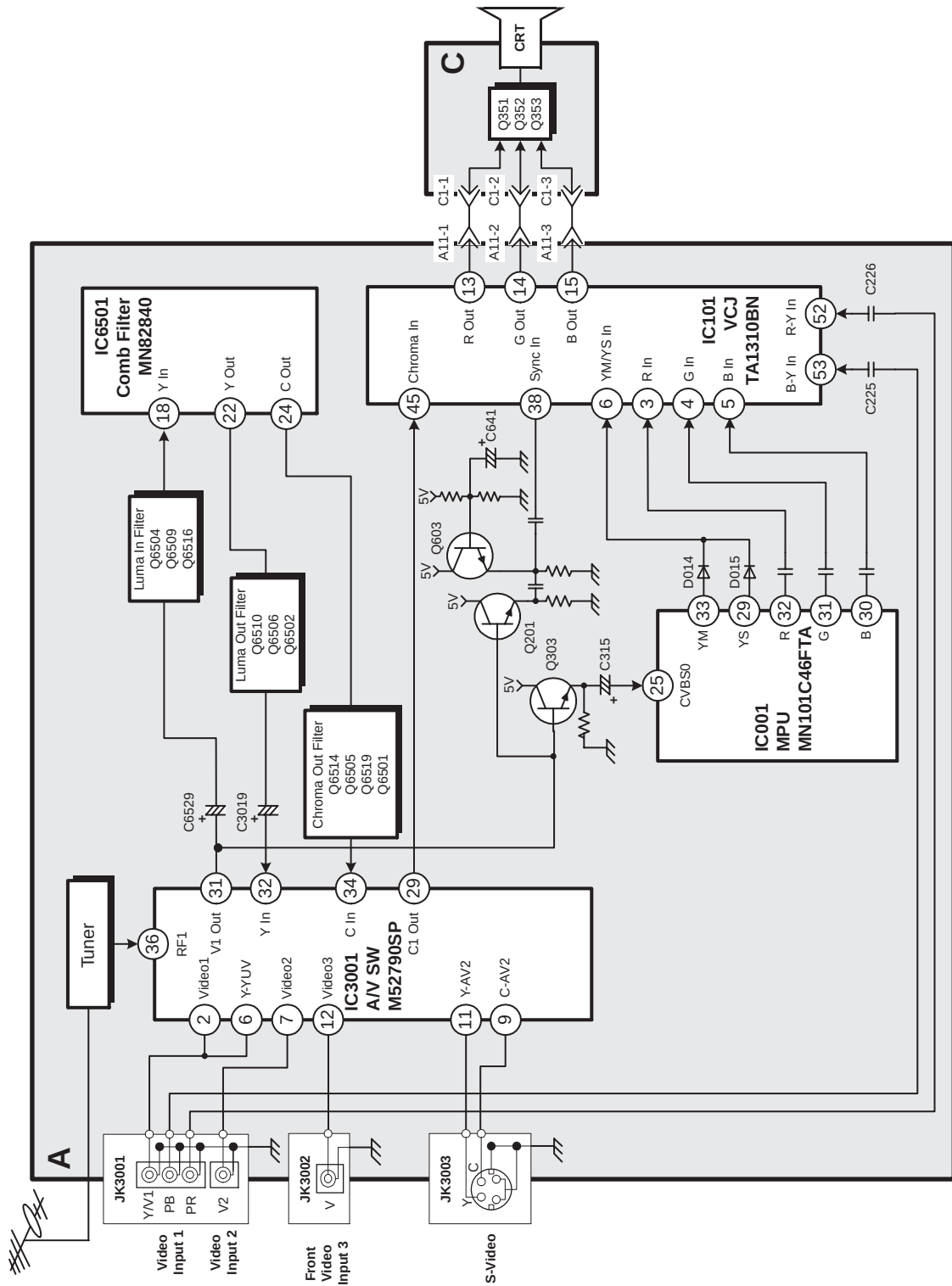


Figure 26. Video Signal Path Block Diagram.

Video-Chroma Signal Path Block Diagram

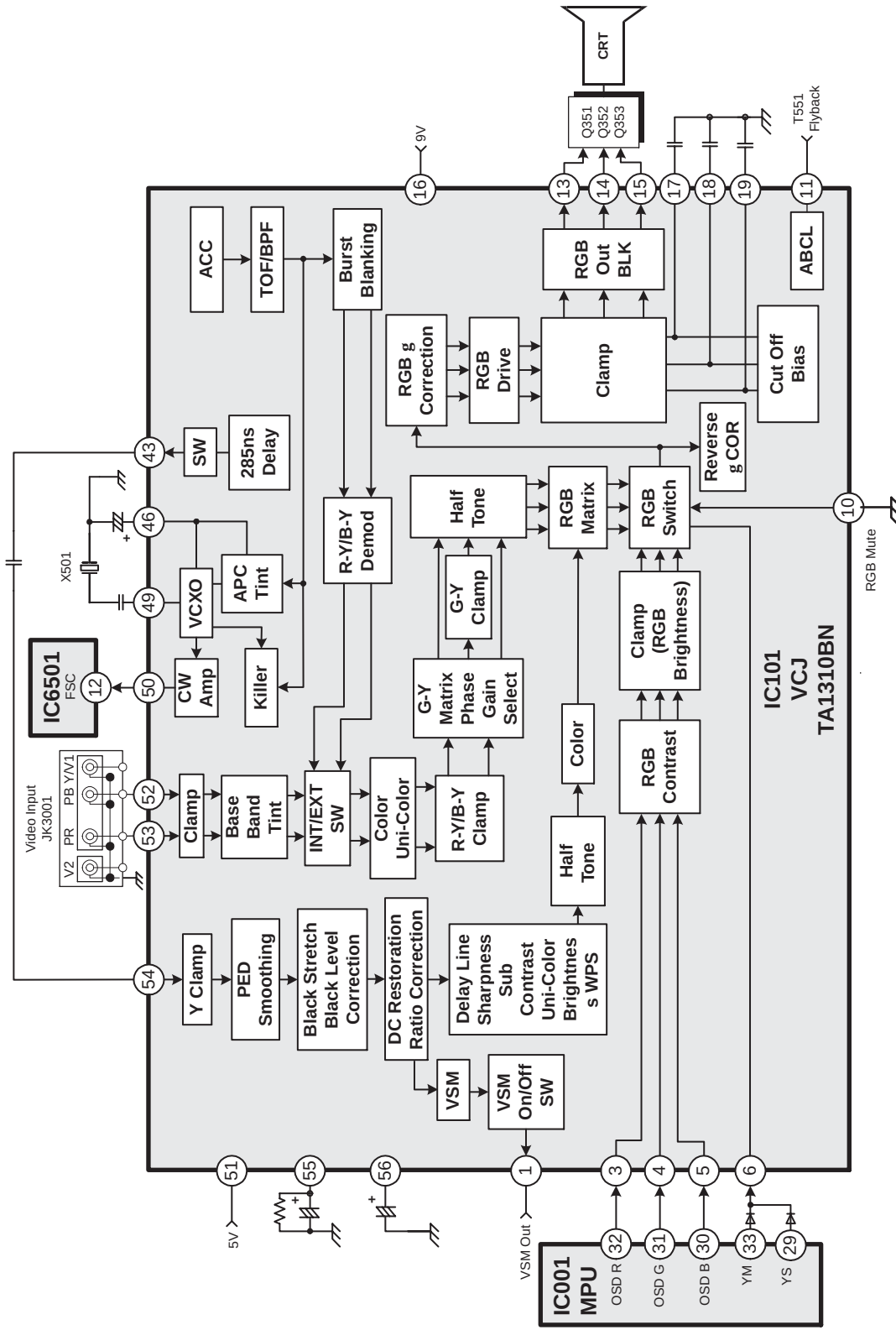


Figure 27. Video-Chroma Path Block Diagram..

IC101 IN/OUT Pins and Functions (VCJ)

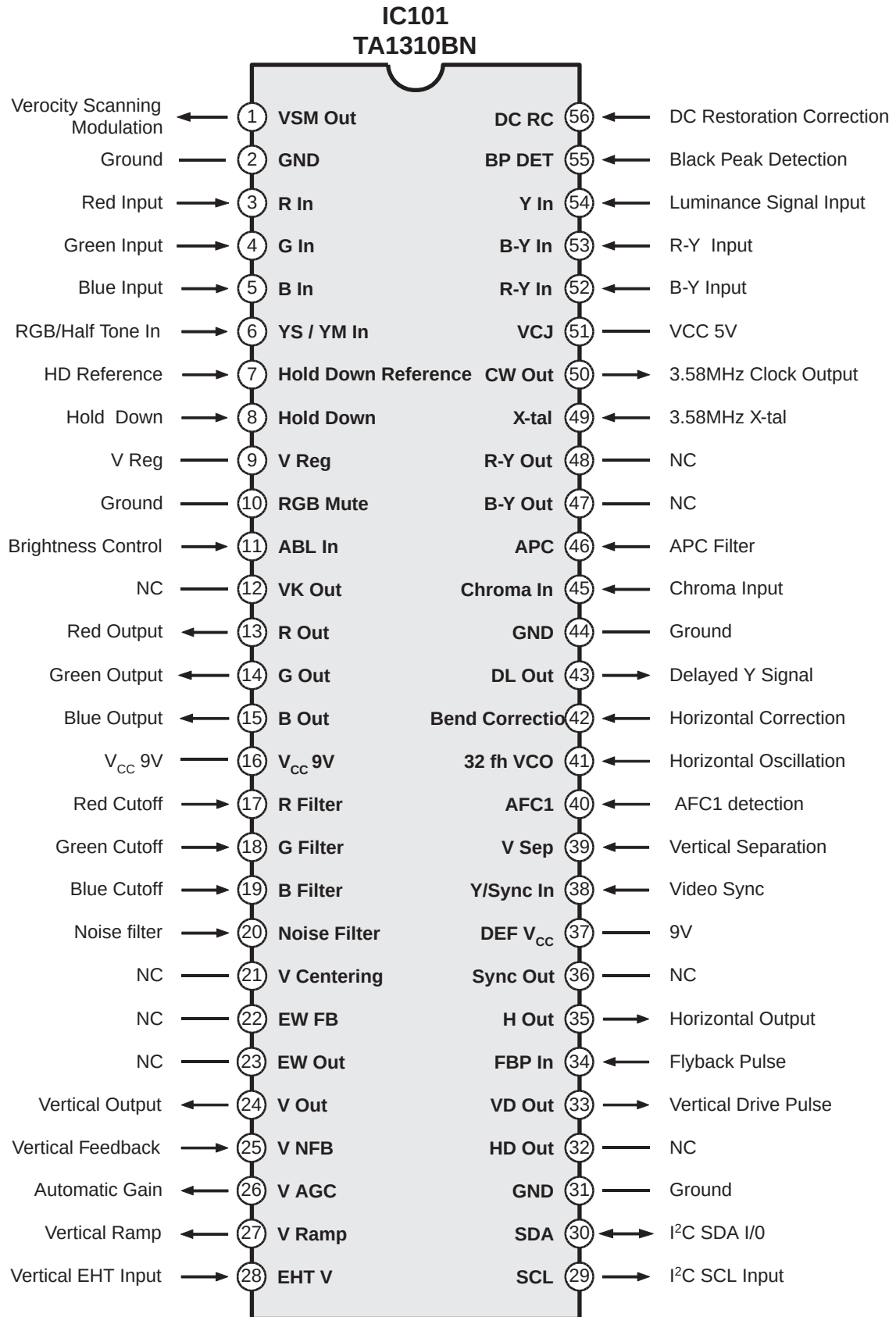


Figure 28. IC101 IN/OUT Pins and Functions (VCJ).

IC001 IN/OUT Pins and Functions (MPU)

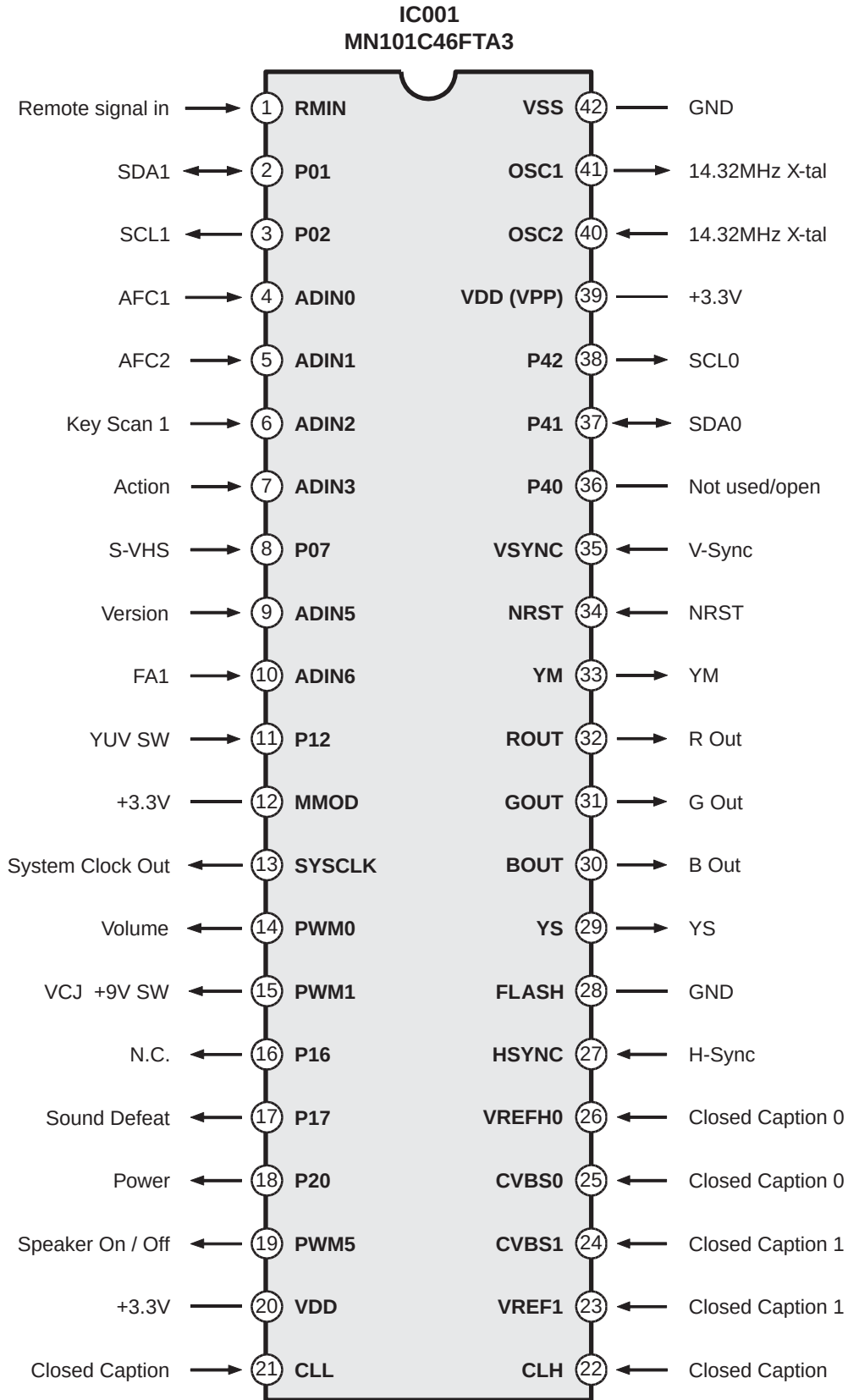


Figure 29. IC001 IN/OUT Pins and Functions (MPU).

Component Identification

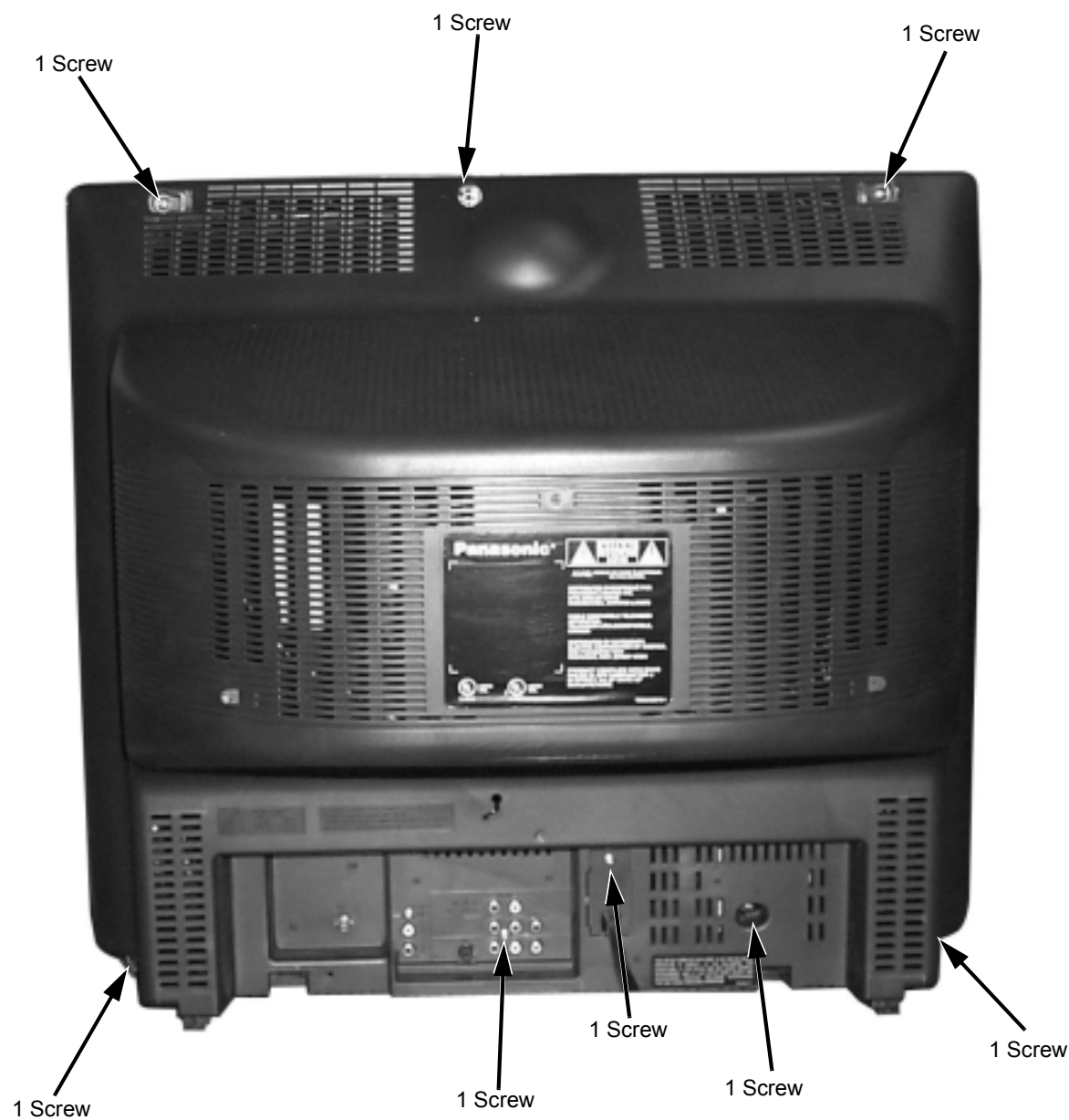


Figure 30. **Cabinet Back**

Component Identification

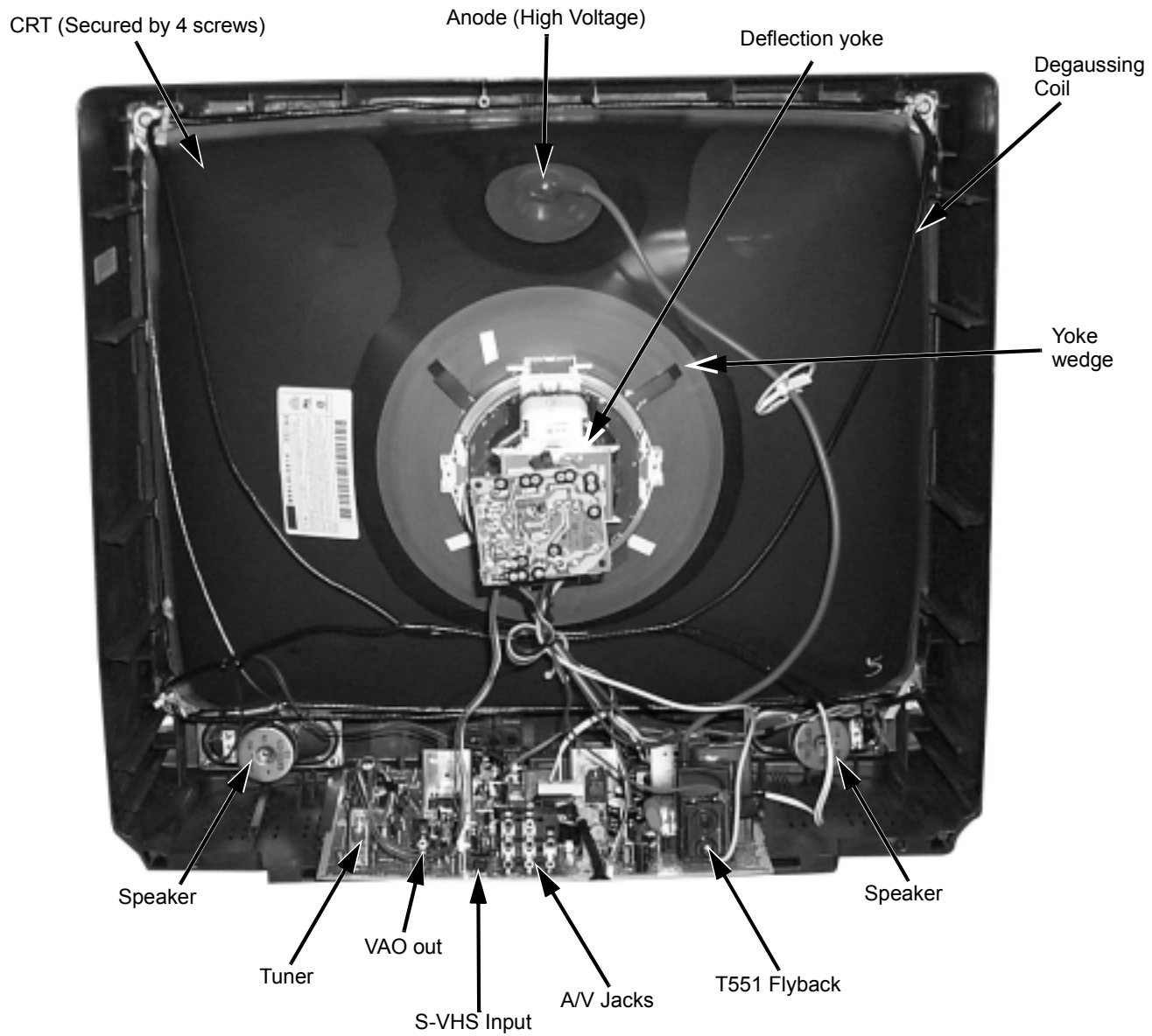


Figure 31. **Rear View**

Note: After servicing the receiver, remember to dress the cables, as shown above.

Component Identification

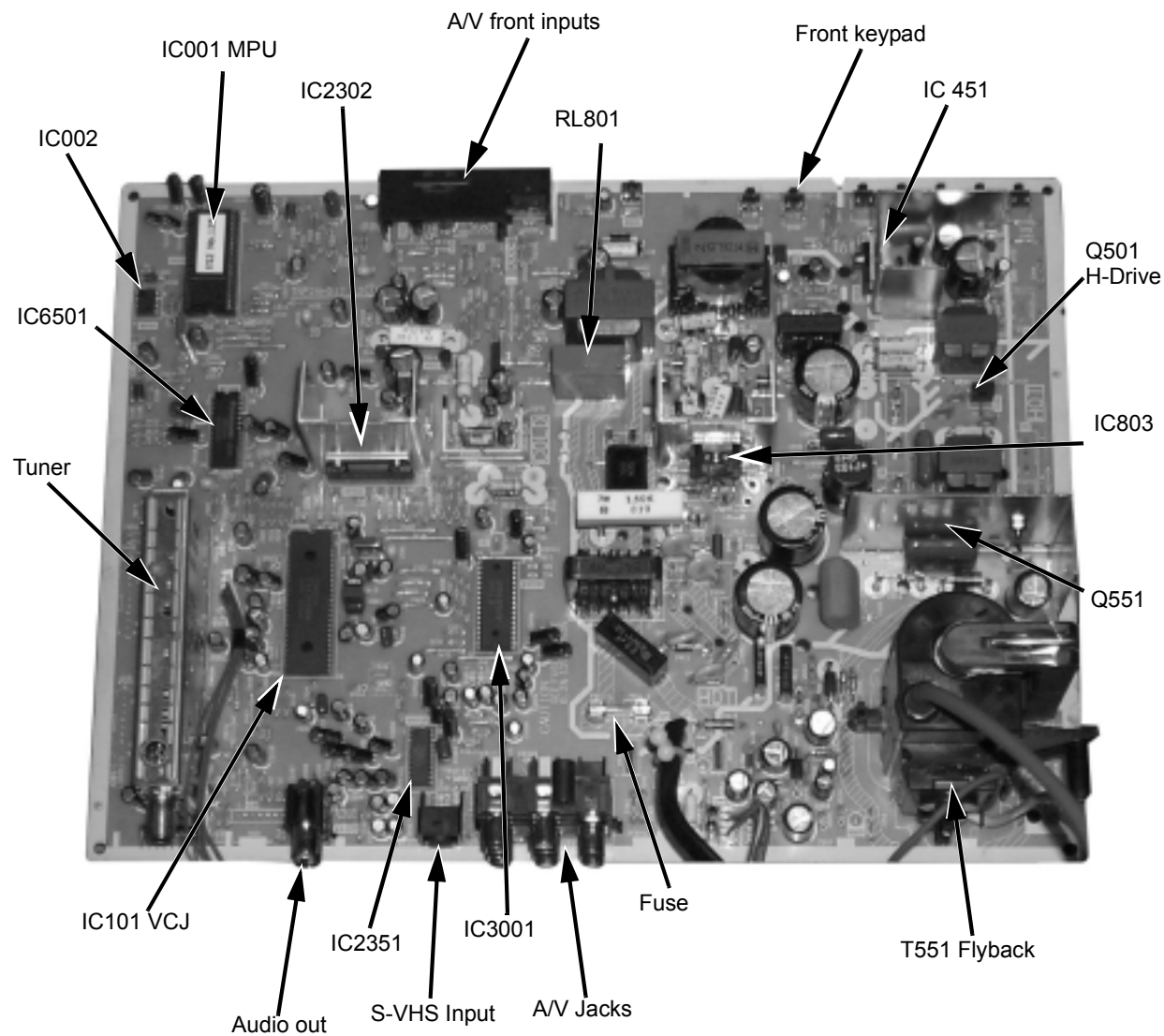


Figure 32. **A-Board**

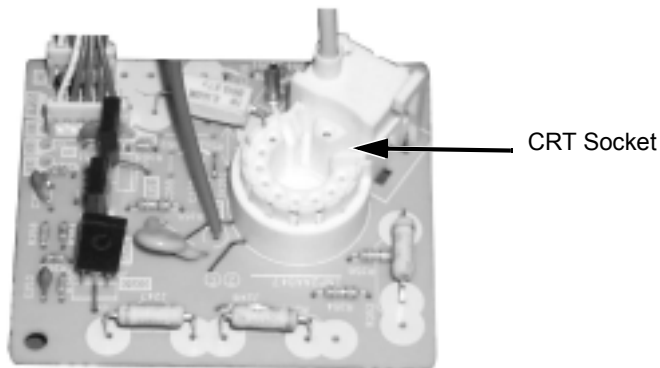


Figure 33. **C-Board**

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
CAPRISTORS		
CRA801	TP00842-51	TAPING GAP TERMINAL
CRA802	TP00842-51	TAPING GAP TERMINAL
CAPACITORS		
C001	ECA1CM470	CAP,E 47UF/16V
C002	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C003	ECA1HM4R7	CAP,E 4.7UF/50V
C005	ECA1CM470	CAP,E 47UF/16V
C006	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C008	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C010	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C013	ECA0JM101	CAP,E 100UF/6.3V
C016	ECJ2VC1H101J	CAP,C 100PF-J-50V
C017	ECJ2VC1H270J	CAP,C 27PF-J-50V
C018	ECJ2VC1H270J	CAP,C 27PF-J-50V
C020	ECA0JM331	CAP,E 330UF/6.3V
C021	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C022	ECA1CM471	CAP,E 470UF/16V
C024	ECA1HM4R7	CAP,E 4.7UF/50V
C025	ECA1HM010	CAP,E 1.0UF/50V
C026	ECA1HM010	CAP,E 1.0UF/50V
C032	ECA1CM331	CAP,E 330UF/16V
C033	ECJ2VC1H680J	CAP,C 68PF-J-50V
C034	ECJ2VC1H680J	CAP,C 68PF-J-50V
C036	ECJ2VC1H101J	CAP,C 100PF-J-50V
C043	ECA1HM2R2	CAP,E 2.2UF/50V
C044	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C047	ECA0JM102	CAP,E 1000UF/6.3V
C048	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C201	ECJ2VB1C104K	CAP,C .1UF-I-16V
C224	ECJ2VB1C104K	CAP,C .1UF-I-16V
C225	ECJ2VB1C104K	CAP,C .1UF-I-16V
C226	ECJ2VB1C104K	CAP,C .1UF-I-16V
C301	ECJ2VB1C104K	CAP,C .1UF-I-16V
C302	ECJ2VB1C104K	CAP,C .1UF-I-16V
C303	ECJ2VB1C104K	CAP,C .1UF-I-16V
C307	ECA1HM0R1	CAP,E 0.1UF/50V
C309	ECJ2VC1H390J	CAP,C 39PF-J-50V
C310	ECJ2VC1H390J	CAP,C 39PF-J-50V
C314	EEANA1E1R0B	CAP,E 1.0UF-25V
C315	EEANA1E1R0B	CAP,E 1.0UF-25V
C320	ECJ2VF1H104Z	CAP,C .1UF-Z-50V
C321	ECJ2VB1H103K	CAP,C .01UF-K-50V
C322	ECJ2VB1H103K	CAP,C .01UF-K-50V
C323	ECJ2VB1H103K	CAP,C .01UF-K-50V
C324	ECJ2VF1H104Z	CAP,C .1UF-Z-50V
C330	ECA1AM101	CAP,E 100UF/10V
C331	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C337	ECA1HM2R2	CAP,E 2.2UF/50V
C342	ECA1HM010	CAP,E 1.0UF/50V

REF NO.	PART NO.	DESCRIPTION
C351	TACCW331T50V	CAP,C 330PF/50V
C352	TACCW331T50V	CAP,C 330PF/50V
C353	TACCW331T50V	CAP,C 330PF/50V
C354	ECKD3D102KB	CAP,C .001UF-K-2KV
C357	EEANA1E1R0B	CAP,E 1.0UF-25V
C401	ECJ2VB1C104K	CAP,C .1UF-I-16V
C402	ECA1HM470	CAP,E 47UF/50V
C403	ECA1HM010	CAP,E 1.0UF/50V
C404	ECA1HM010	CAP,E 1.0UF/50V
C405	ECSF1EE105	CAP,T 1.0UF/25V
C407	ECA1HM470	CAP,E 47UF/50V
C409	ECJ2VC1H101J	CAP,C 100PF-J-50V
C415	ECJ2VF1H104Z	CAP,C .1UF-Z-50V
C451	ECA1HM2R2	CAP,E 2.2UF/50V
C452	ECQB1H473JM	CAP,P .047UF-J-50V
C453	ECA1VM471	CAP,E 470UF/35V
C454	ECA1VM221	CAP,E 220UF/35V
C455	ECA1VM222	CAP,E 2200UF/35V
C456	ECCF1H020CC	CAP,C 2PF-C-50V
C457	ECJ2VB1C104K	CAP,C .1UF-I-16V
C458	ECA1CM101	CAP,E 100UF/16V
C459	ECQM1104JZ	CAP,P .1UF-J-100V
C502	ECA1CM221	CAP,E 220UF/16V
C503	ECJ2VC1H221J	CAP,C 220PF-J-50V
C504	ECQB1H222JM	CAP,P 2200PF-J-50V
C505	ECJ2VC1H180J	CAP,C 18PF-J-50V
C506	ECA1AM101	CAP,E 100UF/10V
C507	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C508	ECJ2VC1H102J	CAP,C .001UF-J-50V
C510	ECCD2H100D	CAP,C 10PF-D-500V
C511	ECKD2H821KB	CAP,C 820PF-K-500V
C512	ECKD2H101KB	CAP,C 100PF-K-500V
C514	ECA1HMR22	CAP,E .22UF/50V
C515	ECJ2VC1H222J	CAP,C .0022UF-J-50V
C516	ECJ2VC1H391J	CAP,C 390PF-J-50V
C517	ECJ2VC1H221J	CAP,C 220PF-J-50V
C518	ECJ2VC1H151J	CAP,C 150PF-J-50V
C531	ECA1EM220	CAP,E 22UF/25V
C551	ECA1VM331	CAP,E 330UF/35V
C552	ECA1CM331	CAP,E 330UF/16V
C553	ECA1CM331	CAP,E 330UF/16V
C554	ECKD2H561KB	CAP,C 560PF-K-500V
C555	ECA2EM220	CAP,E 22UF-250V
C556	ECA1CM102	CAP,E 1000UF/16V
C557	ECKD2H102KB	CAP,C .001UF-K-500V
C558	ECA1CM221	CAP,E 220UF/16V
C560	ECEA1HN2R2U	CAP,E 2.2UF/50V
C561	ECKD2H561KB	CAP,C 560PF-K-500V
C562	ECKD2H561KB	CAP,C 560PF-K-500V
C563	ECWH12H822JS	CAP,P .0082UF-J-1.2KV

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
C564	ECWH12H272JS	CAP,P .0027UF-J-1.2KV	C2307	ECA1CM102	CAP,E 1000UF/16V
C565	ECKD3D821JB	CAP,C 820PF-J-2KV	C2309	ECQB1H473JM	CAP,P .047UF-J-50V
C566	ECKD3D181JB	CAP,C 180PF-J-2KV	C2311	ECA1HM3R3	CAP,E 3.3UF/50V
C568	ECQM2274JZ	CAP,P .27UF-J-200V	C2313	ECA1EM101	CAP,E 100UF/25V
C569	TACFV2E474J	CAP,M .47UF-J-200V	C2314	ECQB1H473JM	CAP,P .047UF-J-50V
C571	ECA1CM471	CAP,E 470UF/16V	C2315	ECA1EM100	CAP,E 10UF/25V
C572	ECA1CM100	CAP,E 10UF/16V	C2321	ECA1EM100	CAP,E 10UF/25V
C573	ECA1CM101	CAP,E 100UF/16V	C2324	ECA1EM100	CAP,E 10UF/25V
C601	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	C2325	ECA1CM102	CAP,E 1000UF/16V
C603	ECQB1H223JM	CAP,P .022UF-J-50V	C2326	ECJ2VB1H223K	CAP,C .022UF-K-50V
C616	ECJ2VB1C104K	CAP,C .1UF-I-16V	C2327	ECJ2VB1H223K	CAP,C .022UF-K-50V
C641	ECA1HM100	CAP,E 10UF/50V	C2328	ECJ2VB1H223K	CAP,C .022UF-K-50V
C801	ECKDAE472ZED	CAP,C .4700PF-Z-250VAC	C2329	ECJ2VB1H223K	CAP,C .022UF-K-50V
C802	ECKDAE472ZED	CAP,C .4700PF-Z-250VAC	C2331	ECA1HM010	CAP,E 1.0UF/50V
C803	ECKDAE472ZED	CAP,C .4700PF-Z-250VAC	C2333	ECA1HM010	CAP,E 1.0UF/50V
C804	ECKDAE472ZED	CAP,C .4700PF-Z-250VAC	C2339	ECA1HM010	CAP,E 1.0UF/50V
C805	EC0S2DA221BB	CAP,E 220UF/200V	C2340	ECA1HM010	CAP,E 1.0UF/50V
C806	EC0S2DA221BB	CAP,E 220UF/200V	C2342	ECA1AM470	CAP,E 47UF/10V
C807	ECA1HM2R2	CAP,E 2.2UF/50V	C2350	EEANA1E100B	CAP,E 10UF-25V
C808	ECA1CM101	CAP,E 100UF/16V	C2351	ECJ2VB1C104K	CAP,C .1UF-I-16V
C809	EC0S2DG151DG	CAP,E 151UF/200V	C2352	ECJ2VB1H472K	CAP,C .0047UF-K-50V
C810	ECQU2A153MV	CAP,P .015UF-M-250V	C2353	ECA1HM4R7	CAP,E 4.7UF/50V
C811	ECQU2A153MV	CAP,P .015UF-M-250V	C2354	ECA1HM4R7	CAP,E 4.7UF/50V
C812	ECQU2A224MV	CAP,P .22UF-M-250VAC	C2355	ECA1HM4R7	CAP,E 4.7UF/50V
C814	ECQB1H823JM	CAP,P .082UF-J-50V	C2356	ECA1HMR47	CAP,E .47UF/50V
C815	ECA1EHG101B	CAP,E 100UF-25V	C2357	ECA1CM100	CAP,E 10UF/16V
C818	ECKD3A821KB	CAP,C 820PF-K-1KVDC	C2358	EEANA1E100B	CAP,E 10UF-25V
C820	ECA1JHG100B	CAP,E 10UF-63V	C2359	ECJ2VB1C104K	CAP,C .1UF-I-16V
C821	ECKD2H561KB	CAP,C 560PF-K-500V	C2360	ECJ2VB1H472K	CAP,C .0047UF-K-50V
C822	ECA1EM221	CAP,E 220UF/25V	C2361	ECA1AM470	CAP,E 47UF/10V
C823	ECA160V33UE	CAP,E 33UF/160V	C2362	ECQB1H104JM	CAP,P .1UF-J-50V
C824	ECKD3A331KB	CAP,C 330PF-K-1KV	C2363	ECJ2BV1C104K	CAP,C .1UF-I-16V
C825	ECKD3A471KB	CAP,C 470PF-K-1KV	C2364	ECA1HM4R7	CAP,E 4.7UF/50V
C2202	ECA1HM2R2	CAP,E 2.2UF/50V	C2365	ECA1AM470	CAP,E 47UF/10V
C2203	ECA1HM4R7	CAP,E 4.7UF/50V	C2366	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C2204	AP106K016CAE	CAP,T 10UF/16V	C3001	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C2205	ECA1HM010	CAP,E 1.0UF/50V	C3002	ECA1AM101	CAP,E 100UF/10V
C2206	ECQB1H223JM	CAP,P .022UF-J-50V	C3003	ECA1CM100	CAP,E 10UF/16V
C2207	AP335K016CAE	CAP,T 3.3UF/16V	C3004	ECA1HM010	CAP,E 1.0UF/50V
C2208	ECJ2VB1C104K	CAP,C .1UF-I-16V	C3006	ECA1HM010	CAP,E 1.0UF/50V
C2209	ECJ2VB1C104K	CAP,C .1UF-I-16V	C3007	ECA1CM100	CAP,E 10UF/16V
C2210	ECJ2VB1C104K	CAP,C .1UF-I-16V	C3008	ECA1CM100	CAP,E 10UF/16V
C2211	ECA1CM100	CAP,E 10UF/16V	C3009	ECA1HM010	CAP,E 1.0UF/50V
C2212	ECQB1H473JM	CAP,P .047UF-J-50V	C3010	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C2215	ECA0JM101	CAP,E 100UF/6.3V	C3011	ECA1HM010	CAP,E 1.0UF/50V
C2218	ECA1HMR47	CAP,E .47UF/50V	C3012	ECA1CM100	CAP,E 10UF/16V
C2301	ECA1VM102	CAP,E 1000UF/35V	C3013	ECA1CM100	CAP,E 10UF/16V
C2302	ECA1HM010	CAP,E 1.0UF/50V	C3014	ECA1HM010	CAP,E 1.0UF/50V
C2305	ECA1HM010	CAP,E 1.0UF/50V	C3016	ECA1HM010	CAP,E 1.0UF/50V
C2306	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	C3018	ECA1CM100	CAP,E 10UF/16V

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
C3019	ECA1CM100	CAP,E 10UF/16V	D557	TVSRU2N	DIODE
C3020	ECA1HM010	CAP,E 1.0UF/50V	D558	RS3FS	DIODE
C3021	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D559	BYD33G-113	DIODE
C3022	ECA1HM010	CAP,E 1.0UF/50V	D561	BYD33G-163	DIODE
C3023	ECA1CM100	CAP,E 10UF/16V	D801	GP15KL-042	DIODE
C6501	ECA0JM101	CAP,E 100UF/6.3V	D802	GP15KL-042	DIODE
C6502	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D805	TRPW5B0M050D	THERMISTOR
C6504	ECJ2VC1H270J	CAP,C 27PF-J-50V	D806	MA4047M	DIODE, ZENER
C6507	ECJ2VC1H120J	CAP,C 12PF-J-50V	D807	MA165	DIODE
C6510	ECJ2VC1H120J	CAP,C 12PF-J-50V	D809	RU3YX-M	DIODE
C6511	ECA1HM010	CAP,E 1.0UF/50V	D820	EU02V1	DIODE
C6512	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D821	EU02V1	DIODE
C6513	ECJ2VC1H270J	CAP,C 27PF-J-50V	D822	EU02V1	DIODE
C6516	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D823	RL30A	DIODE
C6517	ECEA1HN010U	CAP,E 1UF/50V	D824	EU02V1	DIODE
C6518	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D825	TVSSR2KL	DIODE, PROTECTION
C6520	ECA1CM100	CAP,E 10UF/16V	D826	EU02V1	DIODE
C6521	ECA1AM470	CAP,E 47UF/10V	D829	MA165	DIODE
C6522	ECJ2VC1H221J	CAP,C 220PF-J-50V	D830	MA4270M	DIODE
C6523	ECJ2VF1H104Z	CAP,C .1UF-Z-50V	D2301	MA165	DIODE
C6524	ECA1HM010	CAP,E 1.0UF/50V	D2305	MA4110M	DIODE, ZENER
C6525	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D2306	MA4110M	DIODE, ZENER
C6526	ECA1HM3R3	CAP,E 3.3UF/50V	D2307	MA4110M	DIODE, ZENER
C6527	ECJ2VF1H104Z	CAP,C .1UF-Z-50V	D2308	MA4110M	DIODE, ZENER
C6528	ECA1AM470	CAP,E 47UF/10V	D2315	MA165	DIODE
C6529	ECA1CM100	CAP,E 10UF/16V	D2342	MA165	DIODE
C6531	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D2343	MA165	DIODE
C6532	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D3001	MA4110M	DIODE, ZENER
DIODES			D3002	MA4110M	DIODE, ZENER
D001	ERA15-01	DIODE	D3003	MA4110M	DIODE, ZENER
D002	MA165	DIODE	D3004	MA4110M	DIODE, ZENER
D003	MA4056M	DIODE	D3005	MA4110M	DIODE, ZENER
D006	MA4330H	DIODE	D3006	MA4110M	DIODE, ZENER
D007	ERA15-01	DIODE	D3007	MA4110M	DIODE, ZENER
D008	ERA15-01	DIODE	D3008	MA4110M	DIODE, ZENER
D009	ERA15-01	DIODE	D3009	MA4110M	DIODE, ZENER
D011	MA165	DIODE	D3010	MA4110M	DIODE, ZENER
D014	MA165	DIODE	D3015	MA4110M	DIODE, ZENER
D015	MA165	DIODE	D3016	MA4110M	DIODE, ZENER
D018	MA165	DIODE	D3017	MA4110M	DIODE, ZENER
D451	ERA15-01	DIODE	D3018	MA4110M	DIODE, ZENER
D502	MA4062L	DIODE	D3019	MA4110M	DIODE, ZENER
D530	MA4082L	DIODE	D3020	MA4110M	DIODE, ZENER
D531	AS01	DIODE	D3021	MA4110M	DIODE, ZENER
D532	MA4091M	DIODE, ZENER	D3022	MA4110M	DIODE, ZENER
D551	TVSRU2N	DIODE	D6501	MA165	DIODE
D554	BYD33G-163	DIODE	FUSES		
D555	MA165	DIODE	F801	XBA2A00101	FUSE 6.3A 125V
D556	MA4360H	DIODE, ZENER	F801-1	TP00351-51	FUSE CLIP

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
F801-2	TP00351-51	FUSE CLIP	Q003	2SD601ARTX	TRANSISTOR
INTEGRATED CIRCUITS			Q004	2SC1685QRS	TRANSISTOR
IC001	MN101C46FTA	INT CKT	Q005	2SD601ARTX	TRANSISTOR
IC002	24LC08BIP	INT CKT	Q201	2SD601ARTX	TRANSISTOR
IC003	PIC-26042SR	INT CKT	Q302	2SD601ARTX	TRANSISTOR
IC005	PQ1R33	INT CKT	Q303	2SD601ARTX	TRANSISTOR
IC006	PST9229NR	INT CKT	Q351	2SC3063	TRANSISTOR
IC101	TA1310BN	INT CKT	Q352	2SC3063	TRANSISTOR
IC451	LA7845N	INT CKT	Q353	2SC3063	TRANSISTOR
IC551	AN78M09	PLUS 9V AVR	Q401	2SD601ARTX	TRANSISTOR
IC552	AN7805	INT CKT	Q402	2SD601ARTX	TRANSISTOR
IC801	PC817X2	INT CKT	Q501	2SC4212H	TRANSISTOR
IC803	STR58041A	INT CKT	Q509	2SD601ARTX	TRANSISTOR
IC2201	AN5849S-E1V	INT CKT	Q515	2SD601ARTX	TRANSISTOR
IC2302	AN5272	INT CKT	Q551	2SD2539MA1	TRANSISTOR
IC2351	CXA2021S	INT CKT	Q603	2SD601ARTX	TRANSISTOR
IC3001	M52790SP	INT CKT A/V SWITCH	Q801	2SC1685RSTA	TRANSISTOR
IC6501	MN82840	INT CKT	Q802	2SC1384RS	TRANSISTOR
COILS			Q2302	2SB709ARTX	TRANSISTOR
L001	EXCELSA35	FERRITE BEAD	Q2303	2SD601ARTX	TRANSISTOR
L003	TLTABT2R2K	COIL, PEAKING 2.2UH	Q2342	2SB709ARTX	TRANSISTOR
L004	TLTABT2R2K	COIL, PEAKING 2.2UH	Q2343	2SD601ARTX	TRANSISTOR
L005	ELESN330KA	COIL, PEAKING 33UH	Q2409	2SD601ARTX	TRANSISTOR
L006	EXCELSA24T	FERRITE BEAD	Q2410	2SD601ARTX	TRANSISTOR
L008	TLTABT470K	COIL, PEAKING 47UH	Q6501	2SD601ARTX	TRANSISTOR
L010	TLTABT2R2K	COIL, PEAKING 2.2UH	Q6502	2SD601ARTX	TRANSISTOR
L011	TLTABT2R2K	COIL, PEAKING 2.2UH	Q6504	2SD601ARTX	TRANSISTOR
L012	TLTABT2R2K	COIL, PEAKING 2.2UH	Q6505	2SD601ARTX	TRANSISTOR
L013	TLTABT2R2K	COIL, PEAKING 2.2UH	Q6506	2SD601ARTX	TRANSISTOR
L106	EXCELSA35T	FERRITE BEAD	Q6509	2SD601ARTX	TRANSISTOR
L218	EXCELSA35T	FERRITE BEAD	Q6510	2SB709ARTX	TRANSISTOR
L351	TLTABT101K	COIL, PEAKING	Q6514	2SB709ARTX	TRANSISTOR
L501	ELESN3R3KA	COIL, PEAKING 3.3UH	Q6516	2SB709ARTX	TRANSISTOR
L518	TLTABT120K	COIL, PEAKING 12UH	Q6517	2SD601ARTX	TRANSISTOR
L541	EXCELD35	FERRITE BEAD	Q6519	2SD601ARTX	TRANSISTOR
L551	ELH5L7103	COIL	RELAYS		
L554	EXCELSA24T	FERRITE BEAD	RL801	TSEH8007	RELAY
L555	EXCELSA24T	FERRITE BEAD	RESISTORS		
L556	EXCELSA24T	FERRITE BEAD	R002	ERJ6GEYJ182	RES,M 1.8K-J-1/10
L801	ELF20N020A	COIL, 2UH	R003	ERJ6GEYJ562	RES,M 5.6K-J-1/10
L803	ELF17N007A	LINE FILTER	R004	ERDS1TJ122	RES,C 1.2K-J-1/2
L804	EXCELSA39	FERRITE BEAD	R005	ERDS2TJ101	RES,C 100-J-1/4
L2310	TLTABT2R2K	COIL, PEAKING 2.2UH	R006	ERDS1TJ181	RES,C 180-J-1/2
L6502	ELESN330JA	COIL, PEAKING 33UH	R007	ERJ6GEYJ103	RES,M 10K-J-1/10
L6505	ELESN330JA	COIL, PEAKING 33UH	R008	ERJ6GEYJ103	RES,M 10K-J-1/10
L6507	ELESN150KA	COIL, PEAKING 15UH	R009	ERJ6GEYJ221	RES,M 220-J-1/10
L6508	EXCELSA35T	FERRITE BEAD	R010	ERJ6GEYJ103	RES,M 10K-J-1/10
TRANSISTORS			R012	ERJ6GEYJ103	RES,M 10K-J-1/10
Q001	2SD601ARTX	TRANSISTOR	R013	ERJ6GEYJ223	RES,M 22K-J-1/10
Q002	2SC1685QRS	TRANSISTOR	R014	ERJ6GEYJ472	RES,M 4.7K-J-1/10

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
R015	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R310	ERJ6GEYJ332	RES,M 3.3K-J-1/10
R016	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R312	ERJ6GEYJ393	RES,M 39K-J-1/10
R017	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R328	ERJ6GEYJ334	RES,M 330K-J-1/10
R020	ERJ6GEYJ682	RES,M 6.8K-J-1/10	R341	ERJ6GEYJ474	RES,M 470K-J-1/10
R021	ERJ6GEYJ101	RES,M 100-J-1/10	R351	ERG2FJ123H	RES,M 12K-J-2W
R022	ERJ6GEYJ101	RES,M 100-J-1/10	R352	ERG2FJ123H	RES,M 12K-J-2W
R023	ERJ6GEYJ102	RES,M 1K-J-1/10	R353	ERG2FJ123H	RES,M 12K-J-2W
R024	ERJ6GEYJ221	RES,M 220-J-1/10	R354	ERDS1TJ272	RES,C 2.7K-J-1/2
R025	ERJ6GEYJ223	RES,M 22K-J-1/10	R355	ERDS1TJ272	RES,C 2.7K-J-1/2
R027	ERJ6GEYJ103	RES,M 10K-J-1/10	R356	ERDS1TJ272	RES,C 2.7K-J-1/2
R028	ERJ6GEYJ223	RES,M 22K-J-1/10	R357	ERDS2TJ181	RES,C 180-J-1/4
R030	ERJ6GEYJ102	RES,M 1K-J-1/10	R358	ERDS2TJ181	RES,C 180-J-1/4
R031	ERJ6GEYJ102	RES,M 1K-J-1/10	R359	ERDS2TJ181	RES,C 180-J-1/4
R032	ERJ6ENF1002	RES,M 10K-F-1/10	R360	ERDS2TJ821	RES,C 820-J-1/4
R033	ERJ6GEYJ272	RES,M 2.7K-J-1/10	R361	ERDS2TJ821	RES,C 820-J-1/4
R034	ERJ6GEYJ222	RES,M 2.2K-J-1/10	R362	ERDS2TJ821	RES,C 820-J-1/4
R035	ERJ6GEYJ362	RES,M 3.6K-J-1/10	R363	ERDS2TJ101	RES,C 100-J-1/4
R036	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R364	ERDS2TJ101	RES,C 100-J-1/4
R037	ERJ6GEYJ103	RES,M 10K-J-1/10	R365	ERDS2TJ101	RES,C 100-J-1/4
R038	ERJ6GEYJ223	RES,M 22K-J-1/10	R401	ERJ6GEYJ102	RES,M 1K-J-1/10
R039	ERJ6GEYJ102	RES,M 1K-J-1/10	R402	ERJ6GEYJ471	RES,M 470-J-1/10
R040	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R403	ERJ6GEYJ622	RES,M 6.2K-J-1/10
R041	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R405	ERJ6GEYJ102	RES,M 1K-J-1/10
R042	ERJ6GEYJ102	RES,M 1K-J-1/10	R406	ERJ6GEYJ223	RES,M 22K-J-1/10
R045	ERJ6GEYJ223	RES,M 22K-J-1/10	R407	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R046	ERJ6GEYJ333	RES,M 33K-J-1/10	R408	ERJ6GEYJ471	RES,M 470-J-1/10
R047	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R409	ERJ6GEYJ271	RES,M 270-J-1/10
R049	ERJ6GEYJ101	RES,M 100-J-1/10	R410	ERJ6GEYJ153	RES,M 15K-J-1/10
R060	ERJ6GEYJ471	RES,M 470-J-1/10	R411	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R065	ERJ6GEYJ101	RES,M 100-J-1/10	R412	ERDS2TJ123	RES,C 12K-J-1/4
R066	ERJ6GEYJ103	RES,M 10K-J-1/10	R452	ERDS1FJ1R8	RES,C 1.8-J-1/2
R067	ERJ6GEYJ103	RES,M 10K-J-1/10	R453	ERJ6GEYJ123	RES,M 12K-J-1/10
R068	ERJ6GEYJ103	RES,M 10K-J-1/10	R454	ERJ6GEYJ473	RES,M 47K-J-1/10
R072	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R455	ERJ6GEYJ103	RES,M 10K-J-1/10
R073	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R456	ERG3FJ151H	RES,M 150-J-3W
R074	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R457	ERDS1FJ1R5	RES,C 1.5-J-1/2
R075	ERJ6GEYJ102	RES,M 1K-J-1/10	R458	ERDS1FJ2R7	RES,C 2.7-J-1/2
R076	ERJ6GEYJ102	RES,M 1K-J-1/10	R460	ERJ6GEYJ103	RES,M 10K-J-1/10
R077	ERJ6GEYJ102	RES,M 1K-J-1/10	R461	ERJ6GEYJ223	RES,M 22K-J-1/10
R201	ERJ6GEYJ331	RES,M 330-J-1/10	R465	ERJ6GEYJ103	RES,M 10K-J-1/10
R223	ERJ6GEYJ561	RES,M 560-J-1/10	R468	ER0S2CKF4321	RES,M 4.32K-F-1/4
R225	ERJ6GEYJ331	RES,M 330-J-1/10	R469	ER0S2CKF1471	RES,M 1.47K-F-1/4
R226	ERJ6GEYJ331	RES,M 330-J-1/10	R470	ERDS2TJ102	RES,C 1K-J-1/4
R245	ERJ6GEYJ224	RES,M 220K-J-1/10	R501	ERJ6GEYJ301	RES,M 300-J-1/10
R301	ERJ6GEYJ331	RES,M 330-J-1/10	R502	ERJ6GEYJ562	RES,M 5.6K-J-1/10
R302	ERJ6GEYJ331	RES,M 330-J-1/10	R504	ERJ6GEYJ333	RES,M 33K-J-1/10
R303	ERJ6GEYJ331	RES,M 330-J-1/10	R505	ERDS1TJ181	RES,C 180-J-1/2
R305	ERJ6GEYJ682	RES,M 6.8K-J-1/10	R506	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R306	ERJ6GEYJ682	RES,M 6.8K-J-1/10	R507	ERJ6GEYJ561	RES,M 560-J-1/10
R309	ERJ6GEYJ332	RES,M 3.3K-J-1/10	R508	ERJ6GEYJ471	RES,M 470-J-1/10

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
R509	ERJ6GEYJ221	RES,M 220-J-1/10	R829	ERQ14AJ6R8	RES,F 6.8-J-1/4
R510	ERG3FJ362H	RES,M 3.6K-J-3W	R2203	ERJ6GEYJ751	RES,M 750-J-1/10
R511	ERG3FJ362H	RES,M 3.6K-J-3W	R2206	ERJ6GEYJ102	RES,M 1K-J-1/10
R512	ERG2FJ392H	RES,M 3.9K-J-2W	R2207	ERJ6GEYJ102	RES,M 1K-J-1/10
R513	ERJ6GEYJ471	RES,M 470-J-1/10	R2221	ERJ6GEYJ101	RES,M 100-J-1/10
R514	ERJ6GEYJ102	RES,M 1K-J-1/10	R2301	ERQ2CJP1R0	RES,F 1.0-J-2W
R515	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R2305	ERD25FJ180	RES,C 18-J-1/4
R516	ERJ6GEYJ272	RES,M 2.7K-J-1/10	R2306	ERD25FJ180	RES,C 18-J-1/4
R517	ERJ6GEYJ181	RES,M 180-J-1/10	R2307	ERJ6GEYJ221	RES,M 220-J-1/10
R531	ERD25FJ470	RES,C 47-J-1/4	R2308	ERJ6GEYJ221	RES,M 220-J-1/10
R532	ERJ6ENF5602	RES,M 56K-F-1/10	R2311	ERJ6GEYJ562	RES,M 5.6K-J-1/10
R533	ERJ6ENF2102	RES,M 21K-F-1/10	R2312	ERJ6GEYJ752	RES,M 7.5K-J-1/10
R539	ERJ6GEYJ103	RES,M 10K-J-1/10	R2313	ERJ6GEYJ332	RES,M 3.3K-J-1/10
R544	ERJ6GEYJ183	RES,M 18K-J-1/10	R2318	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R550	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2319	ERJ6GEYJ223	RES,M 22K-J-1/10
R551	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2321	ERDS2TJ181	RES,C 180-J-1/4
R552	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2322	ERDS2TJ181	RES,C 180-J-1/4
R553	ERG3FJ270H	RES,M 27-J-3W	R2323	ERJ6GEYJ822	RES,M 8.2K-J-1/10
R556	ERJ6GEYJ272	RES,M 2.7K-J-1/10	R2325	ERJ6GEYJ103	RES,M 10K-J-1/10
R557	ERJ6GEYJ103	RES,M 10K-J-1/10	R2329	ERJ6GEYJ751	RES,M 750-J-1/10
R558	ERQ1CKPR56	RES,F .56-K-1W	R2330	ERJ6GEYJ183	RES,M 18K-J-1/10
R559	ERG2FJ683H	RES,M 12K-J-2W	R2332	ERJ6GEYJ751	RES,M 750-J-1/10
R561	ERG2FJ102H	RES,M 1K-J-2W	R2333	ERJ6GEYJ183	RES,M 18K-J-1/10
R563	ERDS2TJ683	RES,C 68K-J-1/4	R2334	ERJ6GEYJ472	RES,M 4.7K-J-1/10
R564	ERDS2TJ823	RES,C 82K-J-1/4	R2336	ERJ6GEYJ472	RES,M 4.7K-J-1/10
R566	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2337	ERJ6GEYJ221	RES,M 220-J-1/10
R574	ERG2FJ270H	RES,M 27-J-2W	R2338	ERJ6GEYJ103	RES,M 10K-J-1/10
R601	ERJ6GEYJ391	RES,M 390-J-1/10	R2339	ERJ6GEYJ221	RES,M 220-J-1/10
R618	ERJ6GEYJ474	RES,M 470K-J-1/10	R2340	ERJ6GEYJ223	RES,M 22K-J-1/10
R619	ERJ6GEYJ563	RES,M 56K-J-1/10	R2341	ERJ6GEYJ152	RES,M 1.5K-J-1/10
R620	ERJ6GEYJ153	RES,M 15K-J-1/10	R2342	ERJ6GEYJ223	RES,M 22K-J-1/10
R801	ERF7ZK1R5	RES,W 1.5-K-7W	R2343	ERJ6GEYJ152	RES,M 1.5K-J-1/10
R804	ERW12PK1R8	RES,W 1.8-K-1/2W	R2344	ERJ6GEYJ471	RES,M 470-J-1/10
R805	ERDS2TJ274	RES,C 270K-J-1/4	R2350	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R806	ERDS2TJ274	RES,C 270K-J-1/4	R2351	ERJ6GEYJ105	RES,M 1.0MEG-J-1/10
R808	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2352	ERJ6GEYJ105	RES,M 1.0MEG-J-1/10
R809	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2353	ERJ6GEYJ101	RES,M 100-J-1/10
R810	ERDS1FJ272	RES,C 2.7K-J-1/2	R2355	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R812	ERDS1TJ183	RES,C 18K-J-1/2	R2366	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R813	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R2367	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R815	ERC12ZGM825	RES,S 8.2MEG-M-1/2	R2418	ERJ6GEYJ471	RES,M 470-J-1/10
R818	ERQ12HJR56	RES,F .56-J-1/2	R2419	ERJ6GEYJ471	RES,M 470-J-1/10
R820	ERJ6GEYJ273	RES,M 27K-J-1/10	R3001	ERJ6GEYJ101	RES,M 100-J-1/10
R821	ERJ6GEYJ392	RES,M 3.9K-J-1/10	R3003	ERJ6GEYJ102	RES,M 1K-J-1/10
R822	ERD50FJ474	RES,C 470K-J-1/2W	R3004	ERJ6GEYJ102	RES,M 1K-J-1/10
R823	ERDS2TJ222	RES,C 2.2K-J-1/4	R3005	ERJ6GEYJ330	RES,M 33-J-1/10
R824	ERG3FJ390H	RES,M 39-J-3W	R3006	ERJ6GEYJ750	RES,M 75-J-1/10
R825	ERDS2TJ102	RES,C 1K-J-1/4	R3007	ERJ6GEYJ750	RES,M 75-J-1/10
R826	ERF2AKR22	RES,W .22-K-2W	R3008	ERJ6GEYJ750	RES,M 75-J-1/10
R827	ERDS1FJ561	RES,C 560-J-1/2	R3009	ERJ6GEYJ750	RES,M 75-J-1/10
R828	ERG3FJ470	RES,M 47-J-3W	R3010	ERJ6GEYJ750	RES,M 75-J-1/10

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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REF NO.	PART NO.	DESCRIPTION
R3011	ERJ6GEYJ750	RES,M 75-J-1/10
R3012	ERJ6GEYJ750	RES,M 75-J-1/10
R3013	ERDS2TJ331	RES,C 330-J-1/4
R3014	ERJ6GEYJ330	RES,M 33-J-1/10
R3015	ERDS2TJ102	RES,C 1K-J-1/4
R3016	ERJ6GEYJ102	RES,M 1K-J-1/10
R3017	ERJ6GEYJ330	RES,M 33-J-1/10
R3018	ERJ6GEYJ102	RES,M 1K-J-1/10
R3019	ERDS2TJ102	RES,C 1K-J-1/4
R3020	ERJ6GEYJ330	RES,M 33-J-1/10
R6501	ERJ6GEYJ471	RES,M 470-J-1/10
R6502	ERJ6GEYJ471	RES,M 470-J-1/10
R6503	ERJ6GEYJ471	RES,M 470-J-1/10
R6505	ERJ6GEYJ471	RES,M 470-J-1/10
R6509	ERJ6GEYJ471	RES,M 470-J-1/10
R6510	ERJ6GEYJ102	RES,M 1K-J-1/10
R6511	ERJ6GEYJ123	RES,M 12K-J-1/10
R6512	ERJ6GEYJ102	RES,M 1K-J-1/10
R6513	ERJ6GEYJ152	RES,M 1.5K-J-1/10
R6515	ERJ6GEYJ102	RES,M 1K-J-1/10
R6516	ERJ6GEYJ103	RES,M 10K-J-1/10
R6518	ERJ6GEYJ333	RES,M 33K-J-1/10
R6519	ERJ6GEYJ333	RES,M 33K-J-1/10
R6520	ERJ6GEYJ821	RES,M 820-J-1/10
R6522	ERJ6GEYJ102	RES,M 1K-J-1/10
R6523	ERJ6GEYJ562	RES,M 5.6K-J-1/10
R6524	ERJ6GEYJ471	RES,M 470-J-1/10
R6526	ERJ6GEYJ102	RES,M 1K-J-1/10
R6531	ERJ6GEYJ182	RES,M 1.8K-J-1/10
R6535	ERJ6GEYJ181	RES,M 180-J-1/10
R6537	ERJ6GEYJ392	RES,M 3.9K-J-1/10
R6538	ERJ6GEYJ122	RES,M 1.2K-J-1/10
R6540	ERJ6GEYJ151	RES,M 150-J-1/10
R6542	ERJ6GEYJ680	RES,M 68-J-1/10
R6543	ERJ6GEYJ122	RES,M 1.2K-J-1/10
R6544	ERJ6GEYJ102	RES,M 1K-J-1/10
R6545	ERJ6GEYJ221	RES,M 220-J-1/10
R6548	ERJ6GEYJ471	RES,M 470-J-1/10
R6549	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R6553	ERJ6GEYJ101	RES,M 100-J-1/10
R6554	ERJ6GEYJ473	RES,M 47K-J-1/10
R6555	ERJ6GEYJ153	RES,M 15K-J-1/10
R6556	ERJ6GEYJ333	RES,M 33K-J-1/10
R6557	ERJ6GEYJ123	RES,M 12K-J-1/10
R6558	ERJ6GEYJ331	RES,M 330-J-1/10
R6559	ERJ6GEYJ272	RES,M 2.7K-J-1/10
R6560	ERJ6GEYJ124	RES,M 120K-J-1/10
R6565	ERJ6GEYJ102	RES,M 1K-J-1/10
R6566	ERJ6GEYJ681	RES,M 680-J-1/10
R6567	ERJ6GEYJ471	RES,M 470-J-1/10

REF NO.	PART NO.	DESCRIPTION
R6568	ERJ6GEYJ471	RES,M 470-J-1/10
SWITCHES		
S001	TSE2AD001	SWITCH
S002	TSE2AD001	SWITCH
S003	TSE2AD001	SWITCH
S004	TSE2AD001	SWITCH
S005	TSE2AD001	SWITCH
S008	TSE2AD001	SWITCH
S009	TSE2AD001	SWITCH
TRANSFORMERS		
T001	TLP16297	TRANSFORMER, POWER SUPPLY
T501	TLH15452	TRANSFORMER, HORIZONTAL DRIVER
T502	ETE19Z30AY	TRANSFORMER, HORIZONTAL COUPLING
T551	TLF2AA002	TRANSFORMER, FLYBACK
T801	ETS29AK3L5NC	TRANSFORMER, SWITCHING
CRYSTALS/FILTERS		
X001	TSSA092	CRYSTAL OSCILLATOR
X501	TSS2AA001	CRYSTAL, 3.58MHZ
X601	TAFC5B503F30	CRYSTAL
OTHERS		
M001	ETC33X82NA	YOKE, CONVERGENCE
TNR001	ENG36604G	TUNNER
M002	EUR511502	REMOTE CONTROL
M003	UR51EC975A	BATTERY COVER, REMOTE CONTROL
M004	M68LGL061X	CRT 27
M005	TAS2AA0015	SPEAKER 8-OHM 5W
M006	TBM2A10141	BADGE, PANASONIC
M007	TJS2AC00301	CRT SOCKET
M008	TKX2AA00401	GUIDE, IR
DY	TLY2AA006	DEFLECTION YOKE
M009	TMM2A30702	WEDGE, YOKE
M010	TQB2AA0331	MANUAL, OWNERS CT-27D10B/UB
M011	TQB2AA0356	MANUAL, OWNERS CT-27D10DB
M012	TQB2AA7058	REMOTE GUIDE CT-27D10B/DB/UB
M013	TQB2AA7078	V-CHIP NA8
M014	TSX2AA0111	AC LINE CORD
M015	TXFBX05BSER	ASSY, 7-KEY BUTTON
M016	TXFKU36BSER	ASSY, CABINET BACK CT-27D10B/UB
M017	TXFKU37BSER	ASSY, CABINET BACK CT-27D10DB
M018	TXFKY15BSER	ASSY, CABINET FRONT
M019	TXF3A01ZER	ASSY. DAG GROUND
M020	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP
DEG	0LK19045A	COIL, DEGAUSSING 27
JK3001	TJB2AA0221	TERMINAL, A/V 8P
JK3002	TJB2AA0046	TERMINAL, FRONT A/V
JK3003	TJB2AA0171	TERMINAL, A/V
JK3004	TJB2AA0211	TERMINAL, A/V 2P

DESCRIPTION OF ABBREVIATIONS GUIDE

RESISTOR			
TYPE		TOLERANCE	
C	Carbon	F	+/- 1%
F	Fuse	J	+/- 5%
M	Metal Oxide	K	+/- 10%
S	Solid	M	+/- 20%
W	Wire Wound	G	+/- 2%

RES, C 270-J-1/4

CAPACITOR			
TYPE		TOLERANCE	
C	Ceramic	C	+/- 0.25pF
E	Electrolytic	D	+/- 0.5pF
P	Polyester	F	+/- 1pF
S	Styrol	J	+/- 5%
T	Tantalum	K	+/- 10%
		L	+/- 15%
		M	+/- 20%
		P	+10% -0%
		Z	+80% -20%

CAP, P .068UF-K-50V

NOTES

NOTES

SERVICEMAN MODE (ELECTRONIC CONTROL) SERVICE ADJUSTMENT VALUES

Model _____ Ser # _____ Date _____

Note: Record the original settings PRIOR to modifying the registers.

Mode	Service Adjustment	Def. Val.	Original Value	New Value
Sub Adjustments				
B0	SUB COLOR	31		
B1	SUB TINT	31		
B2	SUB BRIGHTNESS	31		
B3	SUB CONTRAST	16		
B4	SUB TINT VIDEO	16		
B5	SUB COLOR VIDEO	16		
B6	SUB TINT COMPONENT	63		
B7	SUB COLOR COMPONENT	31		
B8	SUB SHARPNESS TV/VIDEO	10		
B9	SUB SHARPNESS S-VHS/COMPONENT	31		
BA	SUB CONTRAST FIXED	15		
Cut-Off Adjustments				
C0	CUT-OFF R	128		
C1	CUT-OFF G	128		
C2	CUT-OFF B	128		
C3	USER BRIGHTNESS	31		
C4	G DRIVE	64		
C5	B DRIVE	64		
C6	DRIVE C TEMP	8		
C7	CONTRAST C TEMP	5		

Note: Some adjustments modes may not be available in some models depending on available options.

Mode	Service Adjustment	Def. Val.	Original Value	New Value
Pin Cushion Adjustments				
D0	H POSITION	16		
D1	V SIZE	31		
D2	V S CORRECTION	4		
D3	V LIN CORRECTION	14		
D4	E/W TRAPEZIUM	8		
D5	V AGC	1		
D6	V POSITION	1		
D7	V CENTERING	63		
D8	V CENTERING DAC SW	0		
D9	V-BLK START PHASE	12		
DA	V-BLK STOP PHASE	14		
MTS Adjustments				
M0	INPUT LEVEL	33		
M1	LOW-LEVEL SEPARATION	6		
M2	HIGH-LEVEL SEPARATION	25		
PIP Adjustments				
P0	PIP COLOR	92		
P1	PIP TINT	54		
P2	PIP BRIGHTNESS	22		
P3	PIP CONTRAST	80		
P4	UP 1/9	26		
P5	DOWN 1/9	143		
P6	LEFT 1/9	10		
P7	RIGHT 1/9	101		
P8	UP 1/16	26		
P9	DOWN 1/16	160		
PA	LEFT 1/16	10		
PB	RIGHT 1/16	116		
PC	PIP FREERUN	N/A		
PD	PIP YDL	4		

SERVICEMAN MODE (ELECTRONIC CONTROL) SERVICE ADJUSTMENT VALUES

Model _____ Ser # _____ Date _____

Note: Record the original settings PRIOR to modifying the registers.

Mode	Service Adjustment	Def. Val.	Original Value	New Value
Options Adjustments				
S0	ABL GAIN	3		
S1	ABL POINT	3		
S2	RGB BRIGHTNESS	8		
S3	RGB GAMMA	1		
S4	COLOR GAMMA	1		
S5	VSM-G	0		
S6	BS POINT	7		
S7	CLOCK ADJUST	128		
S8	LOUD COMP	31		
S9	CAPTION DIG FILTER SW	0		
SA	CAPTION SCROLL	1		
SB	RGB MATRIX	6		
SC	RGB MATRIX COMP	5		

Note: Some adjustments modes may not be available in some models depending on available options.

Mode	Service Adjustment	Def. Val.	Original Value	New Value
Comb Filter Adjustments				
X0	CLIP LEVEL	152		
X1	CSOK	12		
X2	COMB LIMIT	24		
X3	COMB CORE	41		
X4	COMB RF DELAY	20		
X5	COMB VIDEO DELAY	18		
X6	COMB VMLM	90		
X7	COMB VMCO	24		
X8	COMB SHARP	123		
X9	COMB VM LEVEL	255		
XA	COMB VMPKF	1		
XB	H LOCK MODE	1		
XC	H LOCK	70		
XD	H SEP1	313		
XE	H SEP2	266		
XF	SUB H LOCK MODE	0		
X10	SUB H LOCK	70		
X11	SUB H SEP1	313		
X12	SUB H SEP2	266		

Service Manual

Color Television

Main Manual (NA8MS)



Panasonic

Models	Chassis
CT-27SX11E	AP368
CT-27SX11UE	AP368
CT-27SX11CE	AP368
CT-27SX31E	EP368
CT-27SX31UE	EP368
CT-27SX31CE	EP368

This Service manual is issued as a service guide for the models of the **NA8MS** family listed above. Included in this manual are a set of schematic, block diagrams, functional descriptions, alignment procedures, disassembly procedures and a complete parts list.

“WARNING! This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death.”

The service technician is required to read and follow the **“Safety Precautions”** and **“Important Safety Notice”** in this Main Manual.

Panasonic®

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Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol  and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent X-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

Safety Precautions

General Guidelines

An **Isolation Transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the Receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

Always Replace Protective Devices, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this Receiver is operating. Operation of the Receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

Extreme care should be practiced when **Handling the Picture Tube**. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **Test Picture Tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits the X-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **50kV** without causing X-ray radiation.

Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed

metallic part has a return path to the chassis, the reading should be between 240k Ω and 5.2M Ω . If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

Leakage Current Hot Check (Fig. 1)

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5k Ω 10 watt resistor in parallel with a 0.15 μ F capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.

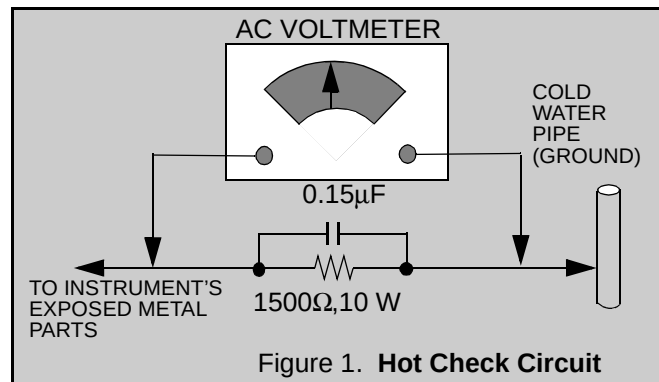


Figure 1. Hot Check Circuit

X-ray Radiation

WARNING: The potential source of X-ray radiation in the TV set is in the High Voltage section and the picture tube.

Note: It is important to use an accurate, calibrated high voltage meter.

Set the **brightness, picture, sharpness** and **color** controls to Minimum. Measure the High Voltage. The high voltage should be **30.55 $\pm$ 1.25kV**. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

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Service Notes

Note: These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

Leadless Chip Component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6k Ω resistor, 0 = 0 Ω (jumper). Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

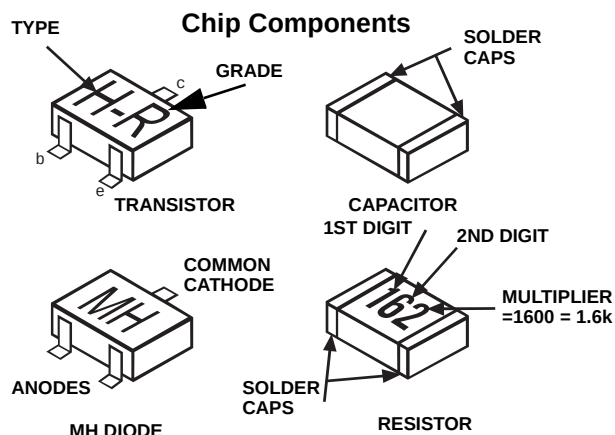
Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

Component Removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

Chip Component Installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.



How to Replace Flat-IC

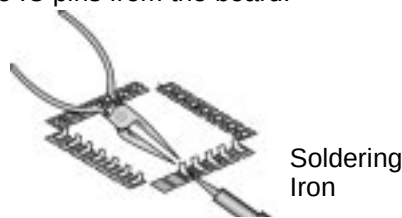
- Required Tools -

- Soldering iron
- Needle nose pliers
- Wire cutters (sharp & small)
- De-solder braids
- Magnifier

1. Cut the pins of a defective IC with wire cutters. Remove IC from board. If IC is glued to the board, heat the IC and release the IC. See Note above.



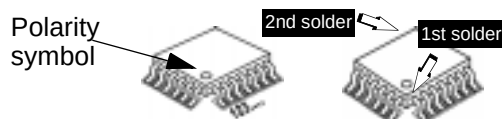
2. Using soldering iron and needle nose pliers remove the IC pins from the board.



3. Using de-soldering braid and soldering iron remove solder from affected area on board (pads).



4. Position the new Flat-IC in place (apply the pins of the Flat-IC to the soldering pads where the pins need to be soldered). Determine the positions of the soldering pads and pins by correctly aligning the polarity symbol. Solder pin #1 first, align the IC.

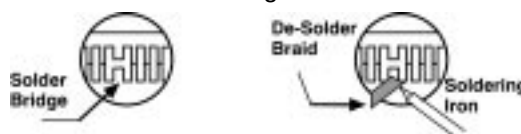


Solder the pin opposite to pin #1. This will assist positioning the IC.

5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



Service Notes (Continued)

IMPORTANT: To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CTR DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the Receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground ∇ () or ($\nearrow$) when servicing, or incorrect voltages will be measured.

WARNING: This Receiver has been designed to meet or exceed applicable safety and X-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol  on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

Board Table Description

BOARD	CT-27SX11E CT-27SX11CE CT-27SX11UE	CT-27SX31E CT-27SX31CE CT-27SX31UE	
A-Board TNP2AH025	NIL	BA	MAIN CHASSIS
C-Board TNP2AA068	AD	AD	CRT BOARD
P-Board TNP2AA078	NIL	NIL	POWER SUPPLY
S-Board TNPA10190	--	AL	SECOND TUNER
Y-Board TNPA1059	--	BC	PIP BOARD

* Note: When ordering a replacement board assembly, append an "S" to the board number.

Example: To order the A-Board for CT-27SX31E, the replacement board is TNP2AH025BAS.

To order the A-Board for CT-27SX11E, the replacement board is TNP2AH025S.

Receiver Feature Table

FEATURE/MODEL	CT-27SX11E/UE/CE	CT-27SX31E/UE/CE
Chassis	NA8MS	
Tunning system	96K	
# of channels	181	
Menu language	Eng/Span/Fr	
Closed Caption	X	
V-Chip (USA/CANADA)	X	
Picture in Picture	--	2 T
2RF	--	X
75Ω input	X	--
Remote Model #	EUR511502	EUR511500
Picture tube	PF 4:3	
Picture tube Supplier	Samsung	
Comb Filter	3 DIG	
HEC/VEC	VEC	
VM	X	
V/A norm	X	
Color Temp	X	
MTS/SAP/DBX	X	
BASS/BL/TRE Control	X	
AI Sound	X	
Surround	X	
SPATIALIZER/BBE	BBE	
Built-in audio power	7W/CH (10%)	
# of speakers	2 (Open Dome)	
A/V in (rear/front)	3(2/1)	
A/V Program Out	--	X
S-VHS Input (rear/front)	1/1	
Component Input (Y,Pb,Pr)	1	
Audio Out (FAO: F, VAO: V)	F,V	
EPJ/HPJ/MISC	HPJ	
Dimensions mm in (WxDxH)	772x596x733.5 27.1x19.8x23.8	
Weight (kg/lbs)	44.5/98.1	
Power source (V/Hz)	120/60	
Anode voltage	30.55kV ± 1.25kV	
Video input jack	1V _{p-p} 75Ω, phono jack	
Audio input jack	500mV RMS 47kΩ	

Specifications are subject to change without notice or obligation. Dimensions and weights are approximate.

Table 1. **Receiver Features**

Location of Controls (Receiver)

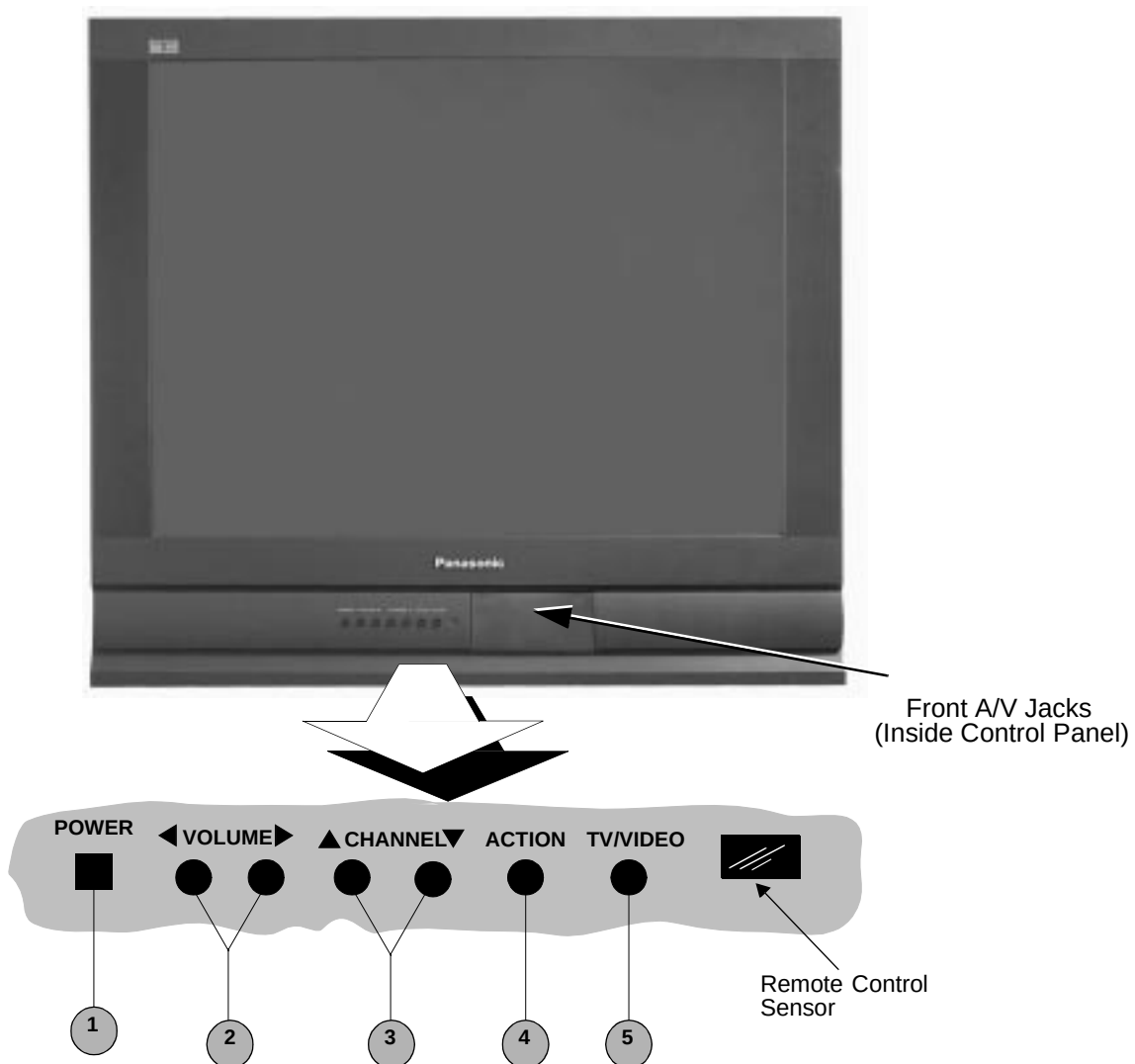


Figure 2. Location of Controls (Receiver).

Quick Reference Control Operation

Quick Reference Control Operation	
1	Power Button - Press to turn ON or OFF.
2	Volume Buttons - Press to adjust Sound Level, or to adjust Audio Menus, Video Menus, and select operating features when menus are displayed
3	Channel Buttons - Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select Cable Converter box channels after programming Remote Control Infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).
4	Action Button - Press to display Main Menu and access On Screen feature and Adjustment Menus.
5	TV/Video Button - Press to select TV or Video Input.

Location of Controls (Remote)

POWER Button
Press to turn ON and OFF.
MUTE Button
Press to mute sound. A second press resumes sound. Press also to access and delete Closed Caption display.
VCR, DVD, LD/CD, AUX, TV, CBL, DBS, RCVR
Component function buttons
VOL (volume) Buttons
Press to adjust TV sound level. Use with Channel buttons to navigate in menus.
R-TUNE (Rapid Tune) Button.
Press to switch to the previous channel.
ACTION Button
Press to display Main Menu and access or exit On Screen features and Adjustment Menus.
REW, PLAY, FF, TV/VCR, STOP, PAUSE, REC, VCR CHANNEL
Component function buttons.
TV/VIDEO Button
Press to select TV or Video input.
CH (channel) Buttons
Press to select channels. Use with volume buttons to navigate in menus.



EUR511500
CT-27SX31E/CE/UE

EUR511502
CT-27SX11E/CE/UE

Figure 3. Location of Controls (Remote).

Disassembly for Service

Back Cover

Remove all the screws marked with an arrow(←) from the back of the Receiver.

Note: Screw configuration, type, and number of screws vary depending on the model of the Receiver serviced and the application; various models are covered in this Manual. Use same hardware when reassembling the receiver.

- 3 screws at the top edge of the Receiver.
- 2 screw by the A/V jacks.
- 1 screw by the antenna jacks.
- 1 screw at each lower corner of the Receiver.
- 1 screw by the retainer plate of the AC power cord.
- 1 screw by the Flyback assy.

A-Board - Main Chassis

The A-Board assembly rest on the cabinet rails as well as the P-Board. Slide chassis out. Disconnect plug connectors; release wire ties and holders as required for complete chassis removal.

The A-Board is connected to the P-Board by two connectors: A1, A2 to P1 and P2 in P-Board. To remove either boards, unplug the connectors on the P-Board.

Note: Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.

C-Board - CRT Output

Plugs into the socket on the CRT neck.

To release the Focus wire, use a flat tool to release the tab in the socket, pull the wire-look up and remove the wire by pulling away the socket, To re-insert, close the wire-look by pushing until is secured with the tab, and insert the wire into the socket

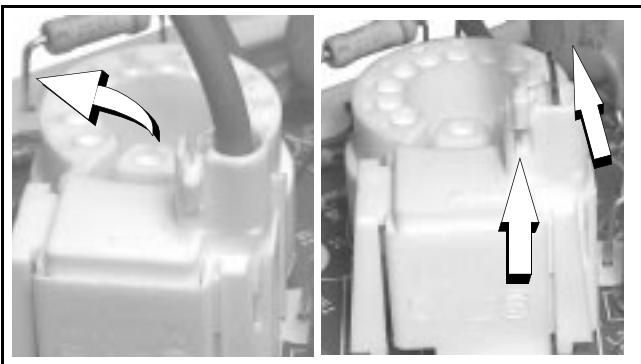


Figure 4. Focus Wire Removal

Speakers

Speakers are assembled to the speaker dome with 4 screws. The speaker/Dome assy is secured to the Speaker Bracket (horn) with 2 screws.

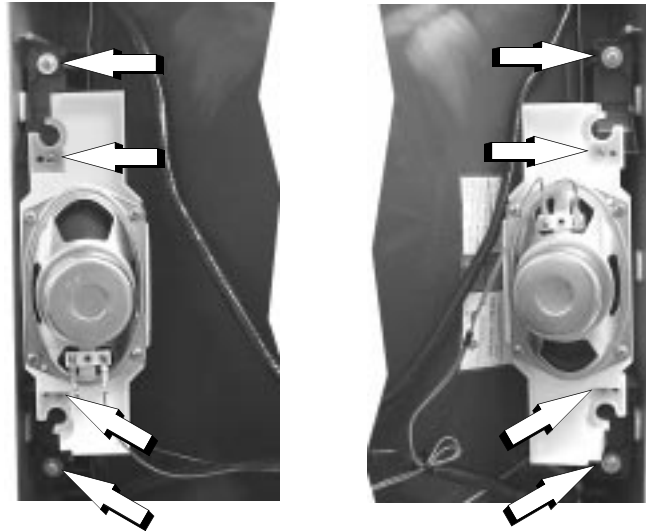


Figure 5. Speaker Removal

Keyboard

Keyboard is pushed to the front by the chassis.

Disassembly for CRT Replacement

1. Discharge the CRT as instructed in the **Safety Precautions** (see page 2).
2. Disconnect the yoke (DY) plug, degaussing coil (DEG) plug and the CRT 2nd anode button from the board.
3. For some models, unplug Geo-magnetic Coil from P-Board, G15.
4. Remove the C-Board from the CRT socket and unplug the black wire (CRT dag ground) C11.
5. Unplug Convergence Yoke CY from C-Board, C2.
6. Lift the Main Chassis (A-Board) and all mounted boards completely out with the CRT Board attached.
7. Disassembly the speakers and speaker brackets from front cabinet.

CRT Replacement

1. Perform **Disassembly for CRT Replacement** procedure.
2. Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the **Safety Precautions** (see page 2) on handling the picture tube.
3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order for the CRT mounting hardware as they are remove from the CRT mounting brackets at each corner of the CRT.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.

Disassembly for Service (Continued)

Note: To remove the four brackets holding the degauss coil from the corners of the CRT, first remove the CRT from the cabinet, then remove the Brackets by pressing the tab on the bracket and pull upwards.

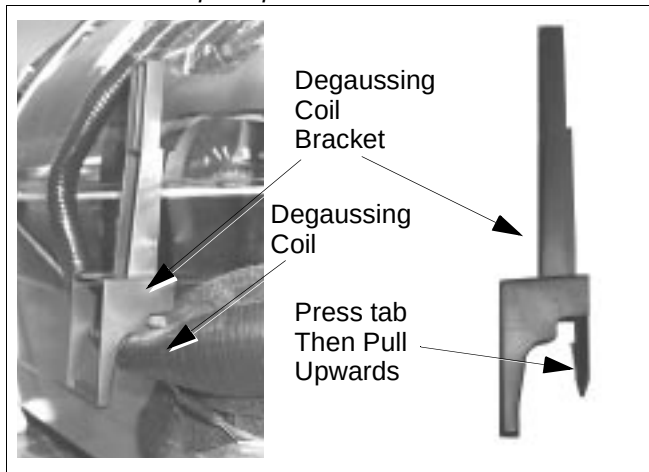


Figure 6. Brackets removal

6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.

To remove and remount the degaussing coil:

The degaussing coil is held in place by clampers fastened to the CRT corner ears. These clampers must be installed onto the replacement CRT prior to mounting the degaussing coil. Confirm Coil is not in contact with speaker bracket.

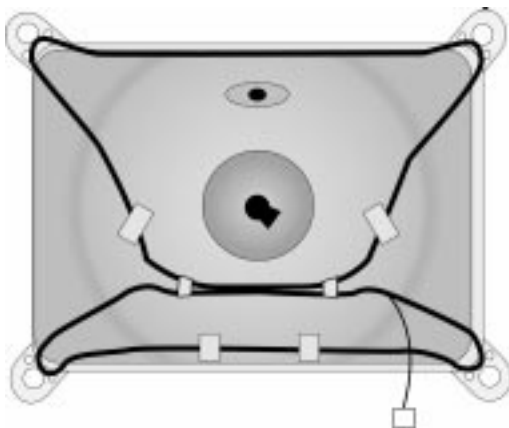


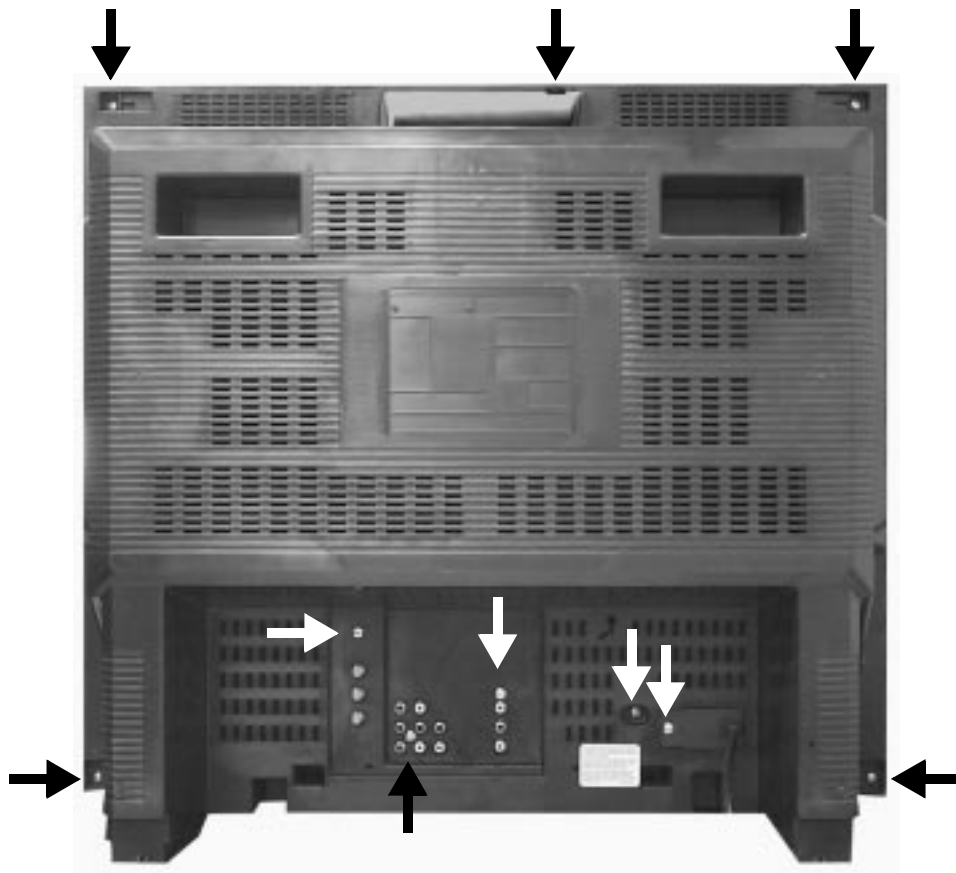
Figure 7. Coil Installation.

To remove and remount the dag ground braid:

- a. Unhook the coil spring from the bottom corners of the CRT ears.
 - b. Release the braid loop from the upper corners of the CRT ears.
7. Mount the dag ground braid on the replacement CRT. Position the degaussing coil with new ties. Dress coil as was on the original CRT.
 8. Replace the components on CRT neck and reinstall into cabinet. Verify that all ground wires and circuit board plugs get connected.

Note: Reuse all the clampers and mounting brackets from the degaussing coil and screen, and when remounting the degaussing coil assure that is not touching the speakers, this can be done by placing some tape (See Fig. 7), this may cause mask vibration. The mounting brackets and clampers are not supplied with the replacements.

Back Cover Removal

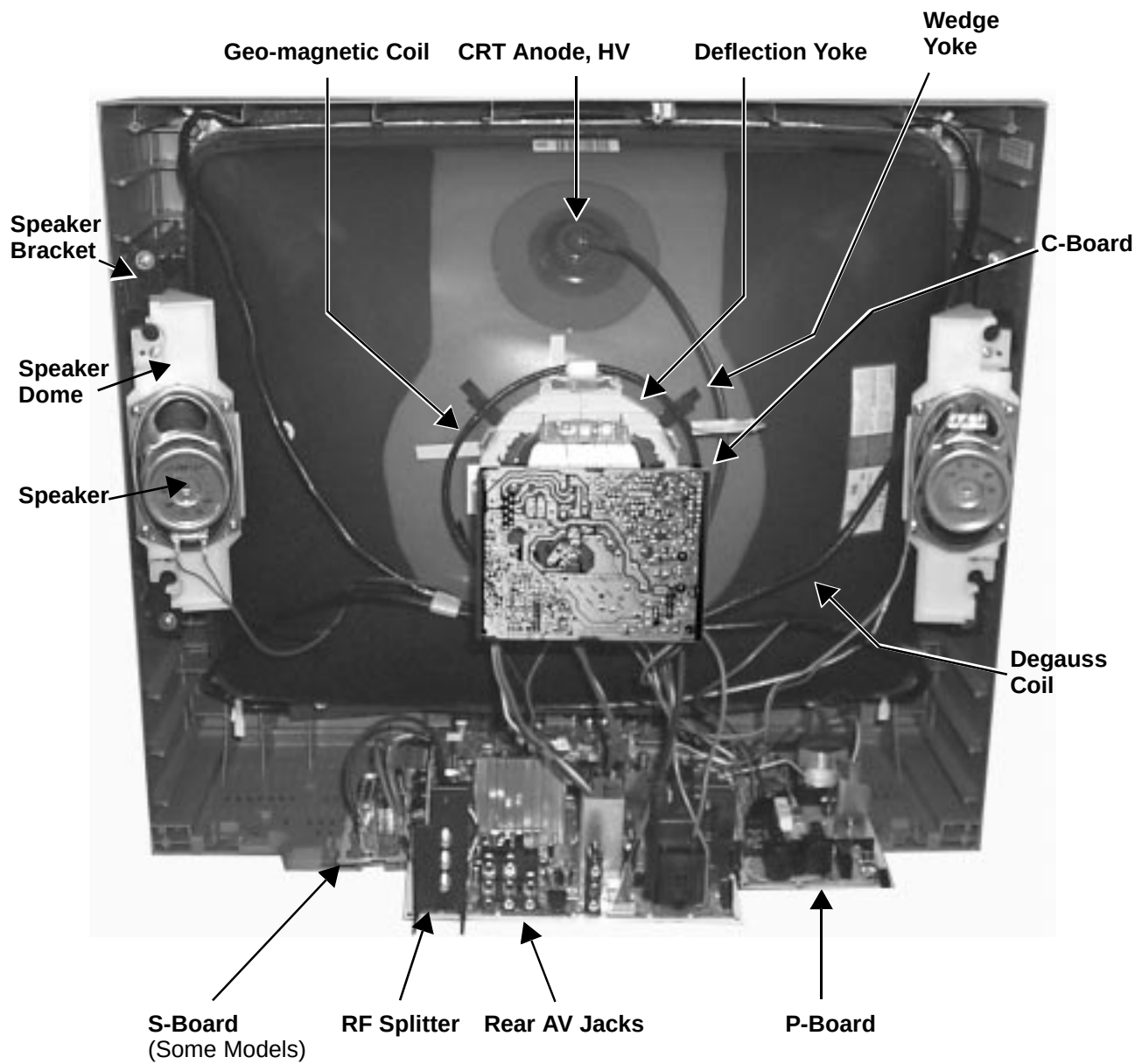


- 3 screws at the top edge of the Receiver.
- 2 screw by the A/V jacks.
- 1 screw by the antenna jacks.
- 1 screw at each lower corner of the Receiver.
- 1 screw by the retainer plate of the AC power cord.
- 1 screw by the Flyback assy.

Figure 8. Back Cover Removal

Note: Screw count may vary according to the models.

Rear View



Note: After servicing the receiver, remember to dress the cables, as shown above.

Main Components Location Main Chassis

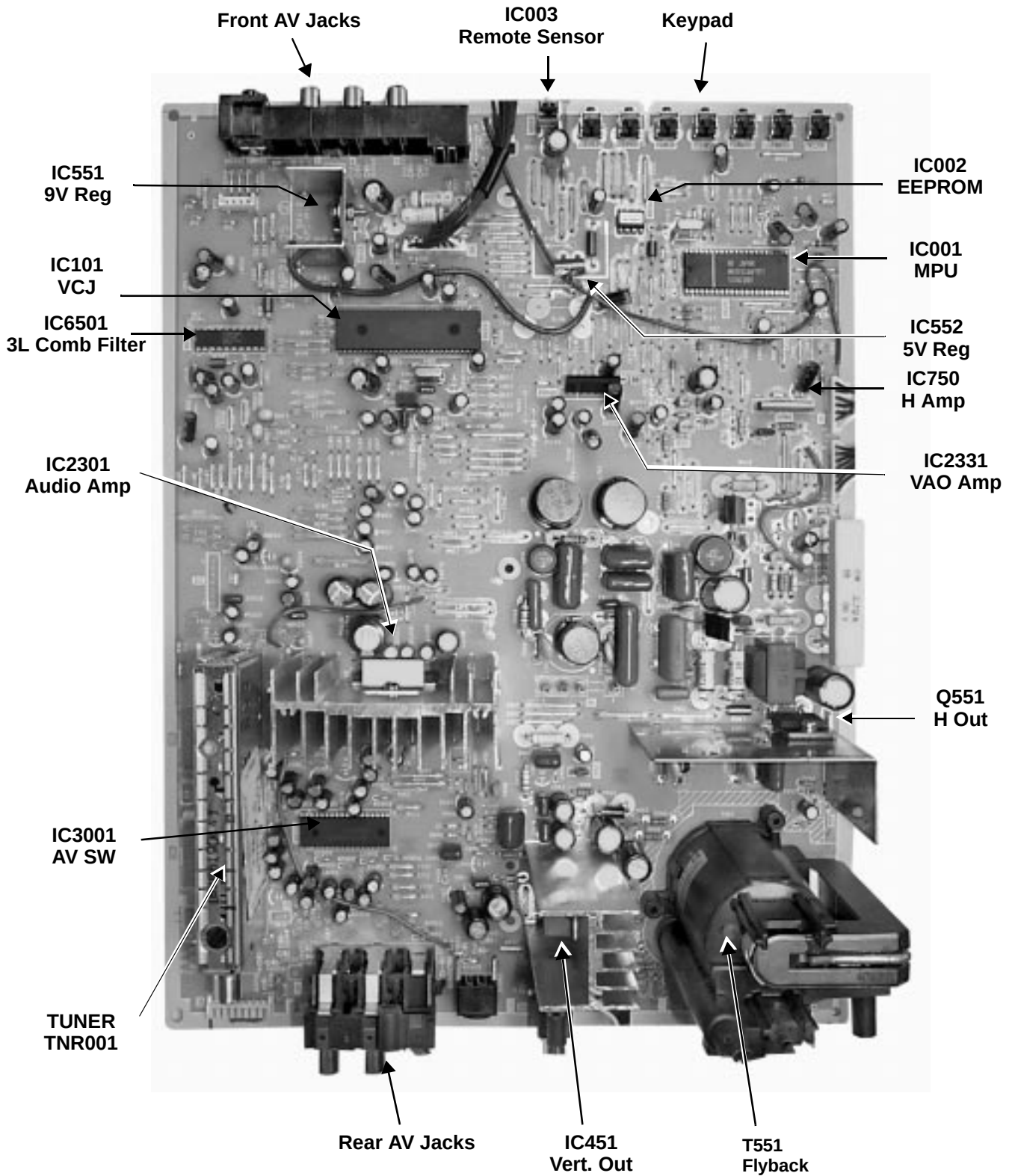
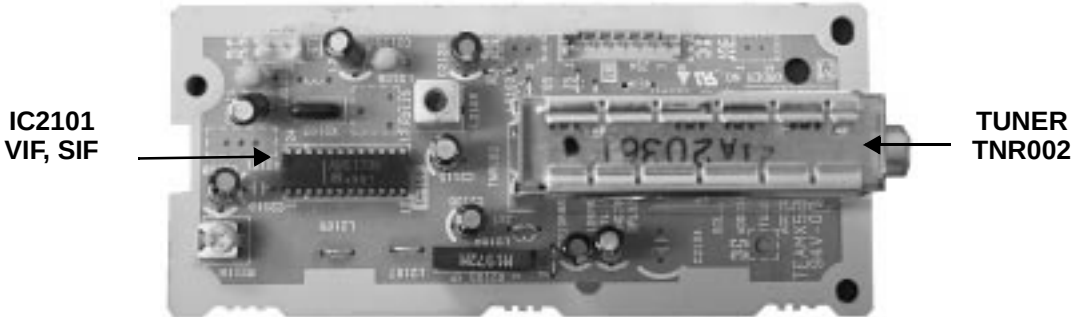
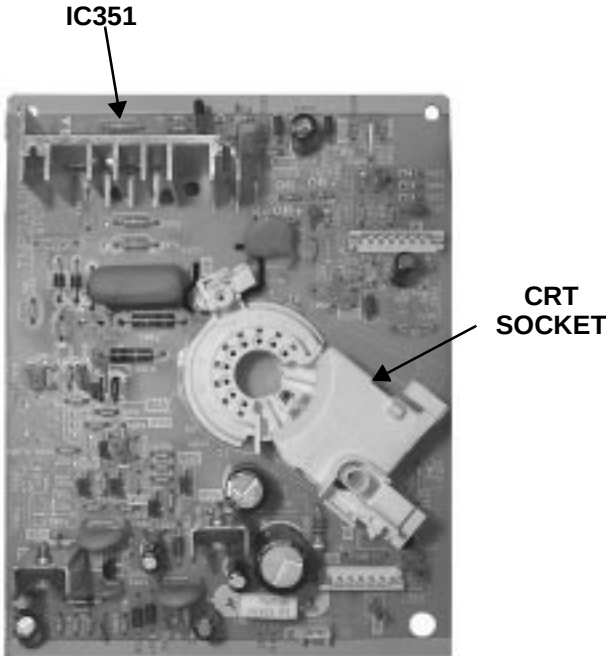
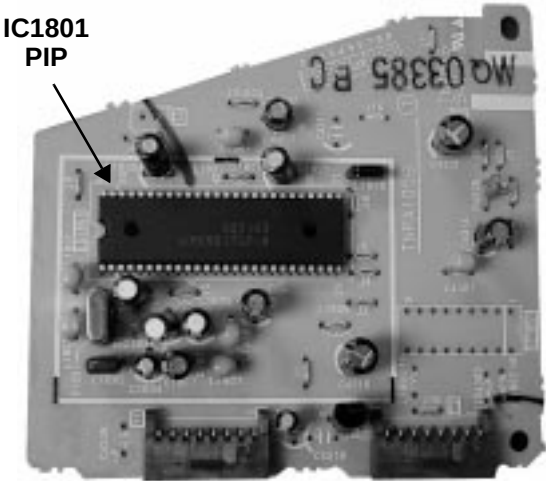
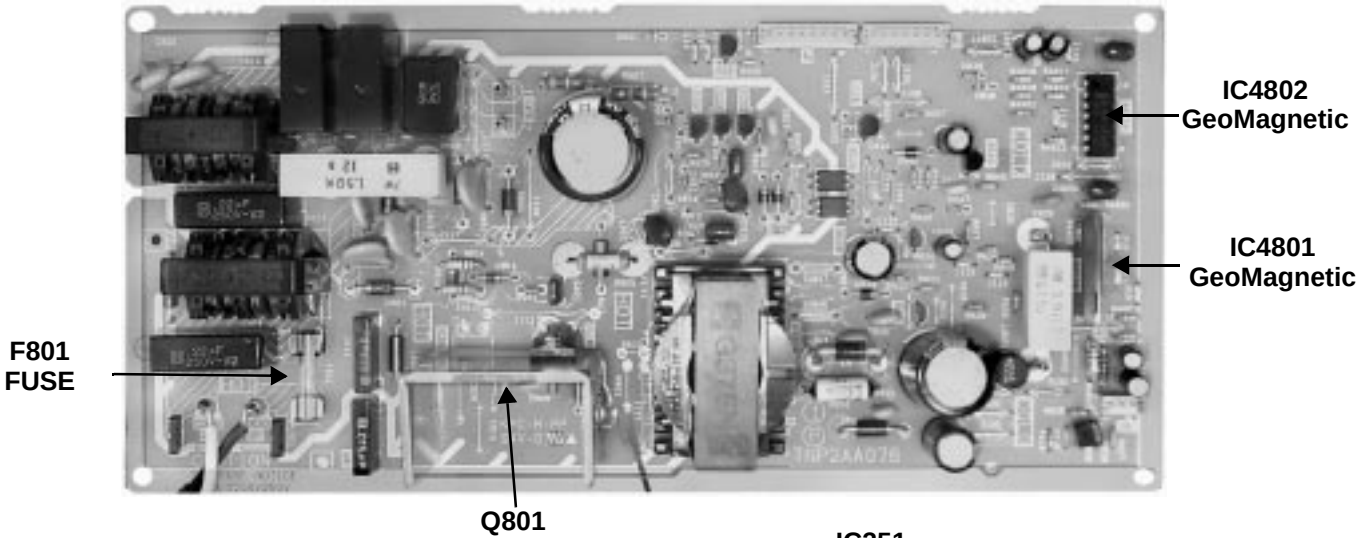


Figure 9. Main Chassis Components

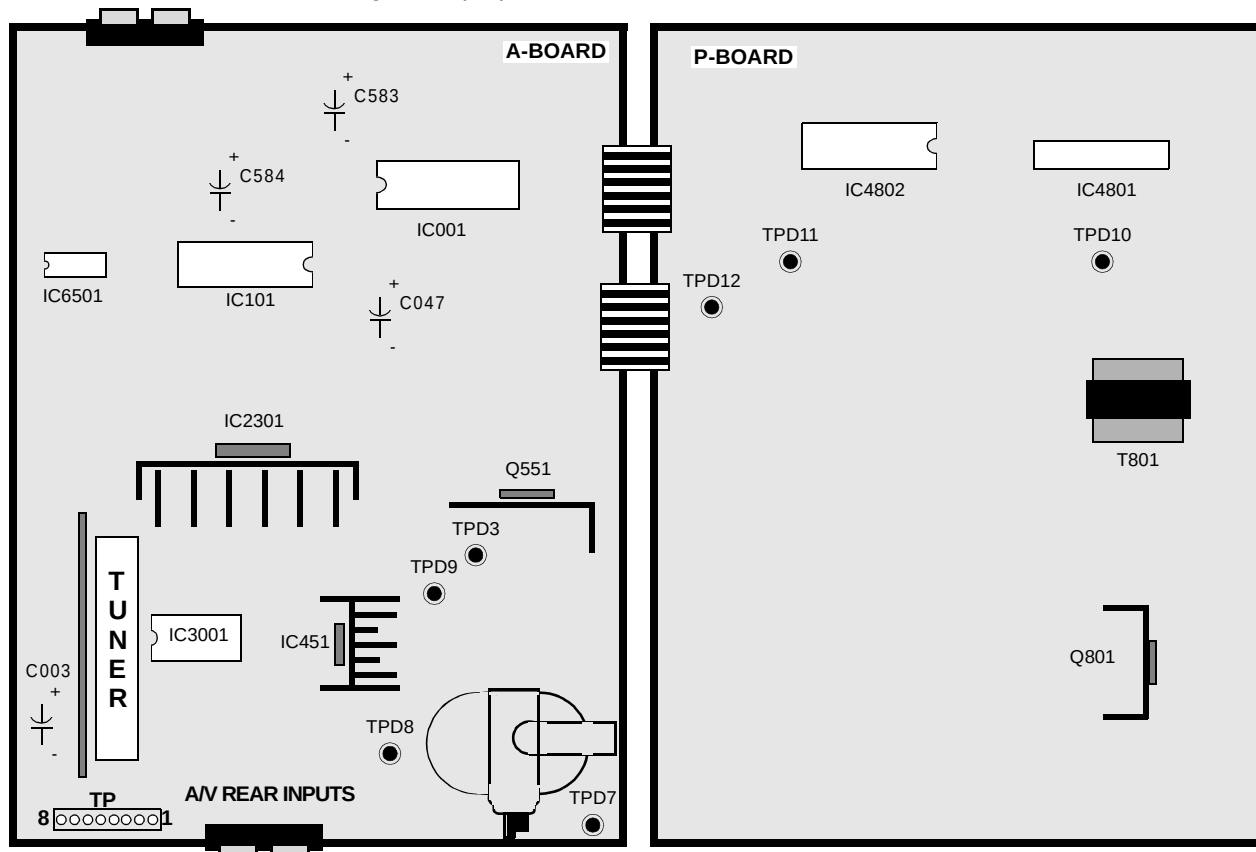
Main Components Location



Chassis Service Adjustment Procedures

All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.

Note: Connect the (-) lead of the voltmeter to the appropriate ground. Use heat sink when the HOT ground symbol (∇) is used. Otherwise, use COLD ground (∇) — Tuner shield.



140.0V B+ Voltage Confirmation

1. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu.
2. Connect the DVM between **TPP12** (+ side) and cold ground (∇). (In P-Board).
3. Confirm that B+ voltage is **140.0V $\pm$ 1.5V**. This voltage supplies B+ to the Horizontal Output & Flyback circuits.

P-Board B+ Voltages

120V AC line input. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu. Use cold ground (∇) for the (-) lead of the DVM.

LOCATION (P-Board)		VOLTAGE Board connected	VOLTAGE Board w/o connect
TPP12	B+	140.0V $\pm$ 1.5V	90.0V $\pm$ 9V
TPP11	STBY 12	13.0V $\pm$ 2V	8.2V $\pm$ 1V
TPP10	SOUND	33.0V $\pm$ 5V	25.0V $\pm$ 3V
For Sound GND use connector P1-pin 5			

A-Board B+ Voltages

120V AC line input. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu. Use cold ground (∇) for the (-) lead of the DVM.

LOCATION (A-Board)		VOLTAGE
C584 (+)	MAIN 9	9.0V $\pm$ 0.5V
C583 (+)	MAIN 5	5.0V $\pm$ 0.3V
TPD9	MAIN -15	-15V $\pm$ 2V
TPD3	MAIN 15	15V $\pm$ 2V
TPD8	MAIN 7.5	7.1V $\pm$ 1.0V
C047 (+)	MAIN -15	-15V $\pm$ 2V
C003 (+)	BTL 32	32.5V $\pm$ 2.0V
TPD7	MAIN 220	220V $\pm$ 9.0V

Adjust Picture Menu for normalized video adjustments.

High Voltage Check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust Brightness and Picture using Picture Icon menu so video just disappears.
3. Confirm B+ 140.0V is within limit.
4. Using a high voltage meter confirm that the High Voltage is $30.55\text{kV} \pm 1.25\text{kV}$.

Purity and Convergence Procedure

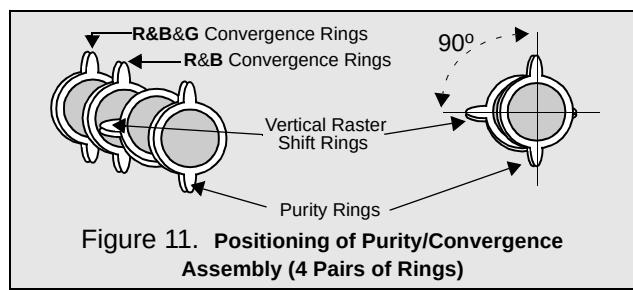
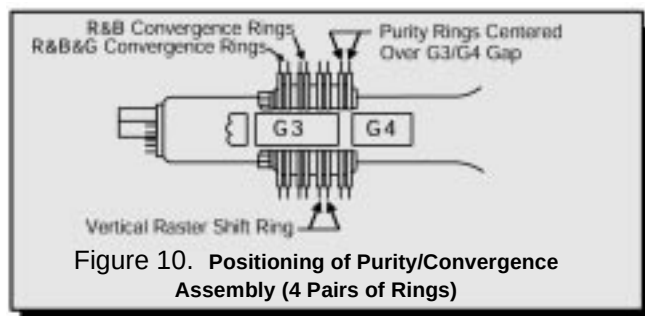
Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

1. Vertical Raster Shift Adjustment.
2. Initial static convergence.
3. Setting the purity.
4. Final static convergence.

When the CRT or the Yoke is Replaced

Place the yoke on the CRT neck (do not tighten the clamp).

Place the vertical raster shift tabs at 3 o'clock (90° from the purity and convergence tabs)



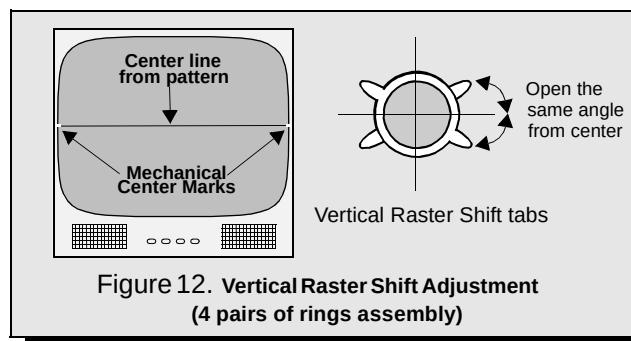
Turn the Receiver ON. Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT.

Fully degauss the Receiver by using an external degaussing coil.

Slide the deflection yoke back and forth on the neck of the CRT until it produces a near white, uniform raster.

Vertical Raster Shift Adjustment.

Apply a green pattern with a horizontal line, adjust the Deflection Yoke so that has no tilt, then secure it. Adjust center line of the pattern with the mechanical center of the CRT, this center is determined by two marks at the side edges of the screen. To adjust the line, once the vertical raster shift tabs are place at 3 o'clock to reduce its magnetic field effect (see Fig. 10 and Fig. 11) open the tabs the same angle from the center, until the center line of the pattern becomes a straight line, centered with the marks of the CRT. (see Fig. 12)



Initial Center Static Convergence

Connect a dot/cross hatch generator to the Receiver and tune in a signal. Observe misconvergence at center of the screen only.

Adjust the R&B pole magnets; by separating tabs and rotating to converge blue with red.

Adjust the R&B and R&B&G pole magnets: by separating tabs and rotating to converge blue and red (magenta) with green.

Note: Precise convergence at this point is not important.

Purity Adjustment

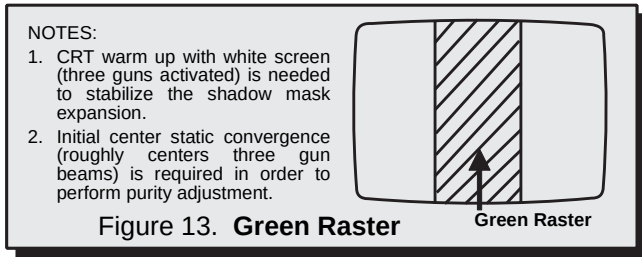
When the Receiver is in the Service Mode, press the **Recall** button on the Remote Control to enter Purity Check. (See the **Service Adjustments Electronic Controls** procedure).

Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT. Fully degauss the Receiver by using an external degaussing coil.

Press the **Recall** button on the Remote Control again until the Purity Check (green screen) appears.

Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

Adjust the Purity rings to set the vertical green raster precisely at the center of the screen (see Fig. 13).



Slowly move the deflection yoke forward until the best overall green screen is displayed.

Tighten the deflection yoke clamp screw.

Press the **Recall** button on the Remote Control again until the purity check blue and red screens appear and observe that good purity is obtained on each respective field.

Press the **Recall** button on the Remote Control again until Purity check (white screen) appears. Observe the screen for uniform white. If purity has not been achieved, repeat the above procedure.

Final Convergence Procedure (see Fig. 17 through Fig. 19):

Note: Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the Receiver. The **Brightness** level should not be higher than necessary to obtain a clear pattern.

Converge the red and the blue dots at the center of the screen by rotating the R&B pole Static Convergence Magnets.

Align The converged red/blue dots with the green dots at the center of the screen by rotating the R&B&G pole Static Convergence Magnets. Melt wax with soldering iron to reseal the magnets.

Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence.

If convergence is not reached at the edges, insert permalloy (see following section) from the DY corners to achieve proper convergence. Recheck for purity and readjust if necessary.

After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.

Secure the deflection yoke by inserting two side wedges at 3 and 7 o'clock positions.

Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

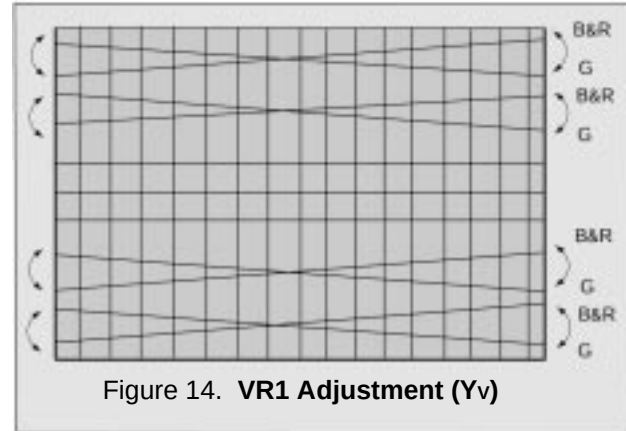
Dynamic Convergence Adjustment

Use this for a precisely overall convergence adjust at the edges.

DY(Y_H , Y_V , X_V) Adjustment

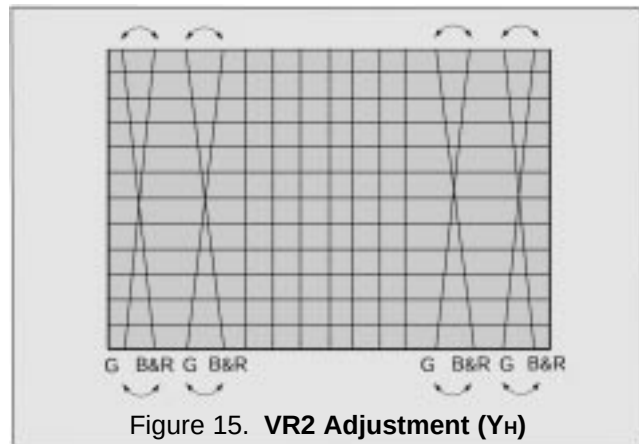
Y_V Adjustment (VR1 for Horizontal dynamic convergence)

1. Apply a crosshatch pattern.
2. Adjust contrast and brightness customer controls to obtain a correct picture.
3. With a driver adjust VR1 (located in deflection yoke board Fig. 19) to obtain a proper convergence at top and bottom of the screen (See Fig. 14)



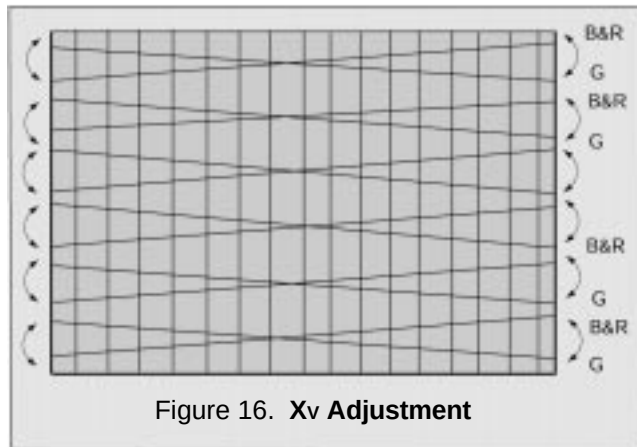
Y_H Adjustment (VR2 for Vertical dynamic convergence)

1. Apply a crosshatch pattern.
2. Adjust contrast and brightness customer controls to obtain a correct picture.
3. With a driver Adjust VR2 (located in deflection yoke board Fig. 19) to obtain a proper convergence at left and right side of the screen. (See Fig. 15)



Xv Adjustment (precise adjustment)

1. Apply a crosshatch pattern.
2. Adjust contrast and brightness customer controls to obtain a correct picture.
3. With a driver adjust the coil located in deflection yoke board to obtain a proper convergence horizontally.



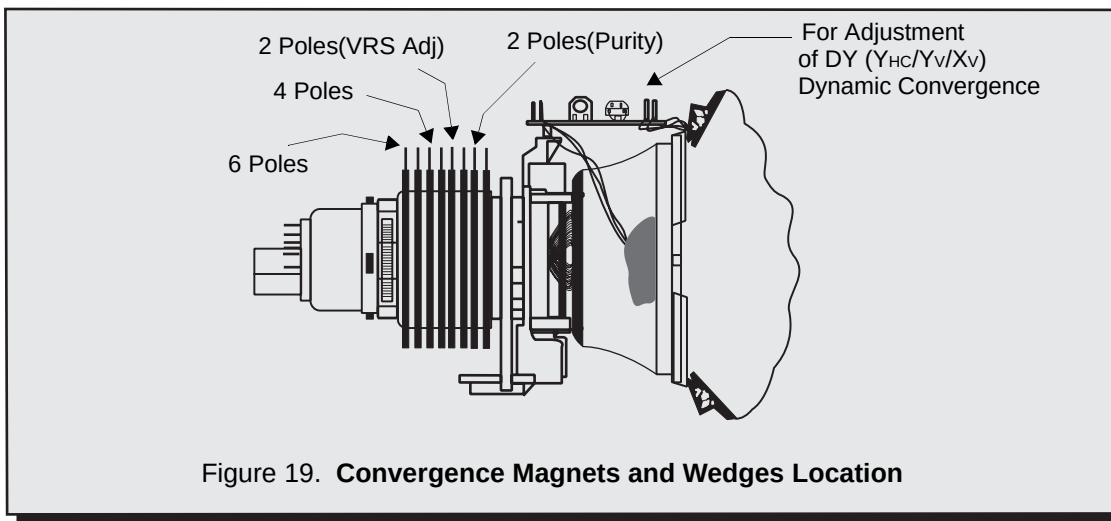
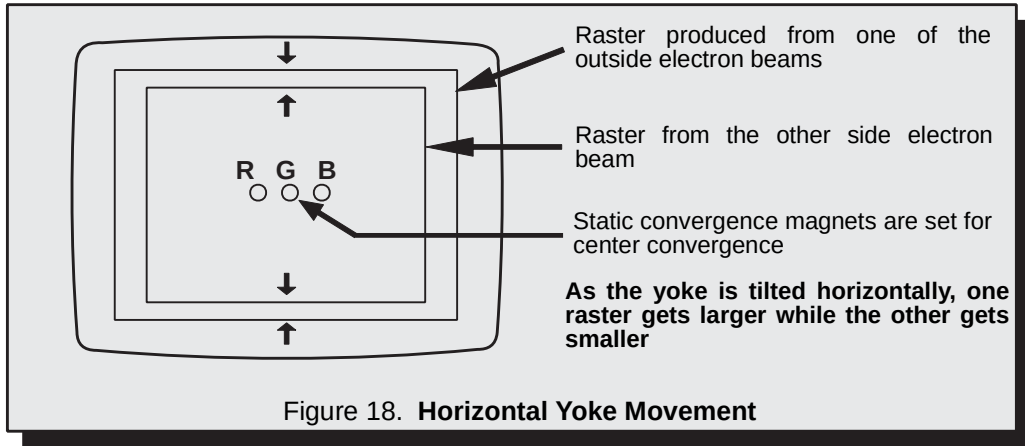
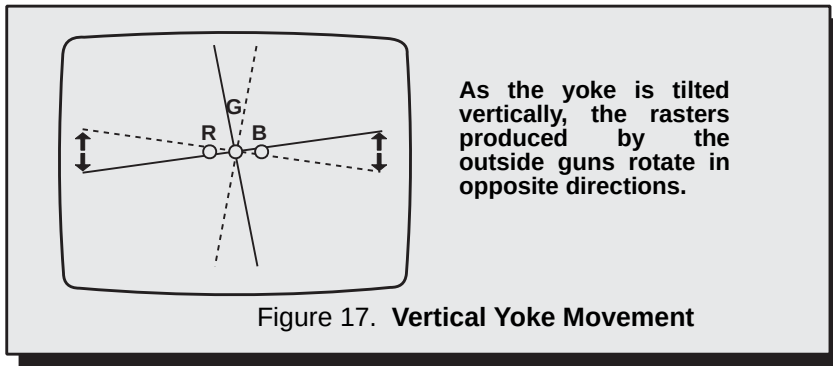
Note: Apply a red pattern and confirm purity, if purity is poor, repeat purity adjustments.

Permalloy Convergence Corrector Strip (Part No. 0FMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required. First converge the set without the strip and observe the corners.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.



IMPORTANT NOTE:
Always Exit the Service Mode
Following Adjustments.

Service Mode (Electronic Controls)

This Receiver has electronic technology using the I²C Bus Concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using "On Screen Display Menu". (The **Service Adjustment Mode**.)

Note: It is suggested that the technician reads all the way through and understand the following procedure for Entering/Exiting the **Service Adjustment Mode**; then proceed with the instructions working with the Receiver. When becoming familiar with the procedure, the Flow Chart for Service Mode may be used as a quick guide.

Quick Entry to Service Mode:

At times when minor adjustments need to be done to the electronic controls, the method of Entering the service Mode without removal of the cabinet back is as follows using the Remote Control:

1. Select SET-UP icon and select CABLE mode.
2. Select TIMER icon and set SLEEP time for 30 Min.
3. Press ACTION button 3 times to exit menus.
4. Tune to the Channel 124.
5. Adjust VOLUME to minimum (0).
6. Press the VOL ◀ button (decrease) on Receiver. Red "CHK" appears in upper corner.

To toggle between Aging and Service modes:

While the "CHK" is displayed on the left top corner of the CRT, pressing the Action and the Volume Up buttons on the Receiver simultaneously will toggle between the modes. Red "CHK" for Service and yellow "CHK" for Aging.

7. Press the **Power** Button on the **Remote Control** to select one of the Service Adjustment Modes.
 - 1) **B** Service VCJ SUB-DATA ADJUSTMENT.
 - 2) **C** Service VCJ CUT-OFF ADJUSTMENT.
 - 3) **D** Service GEOMETRY ADJUSTMENT.
 - 4) **M** Service MTS ADJUSTMENTS.
 - 5) **P** Service PIP ADJUSTMENT.
 - 6) **S** Service S OPTION ADJUSTMENTS.
 - 7) **X** Service COMB FILTER ADJUSTMENT.
 - 8) **E** Service AUDIO ADJUSTMENTS
 - 9) "CHK" = Normal operation of CHANNEL ▲▼ and VOLUME ◀▶.

Note: Only the applicable settings for the Receiver serviced will be available (See a in Fig. 20).

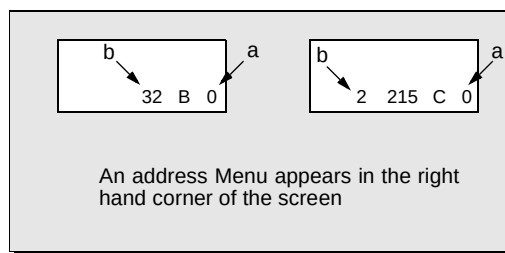


Figure 20. **Service Mode Menu Adjustments.**

Exiting the Service Mode:

Press the **Action** and the **Power** buttons on the **Receiver** simultaneously for at least 2 seconds.

THE RECEIVER EXITS SERVICE MODE.

The Receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound. Any programmed channels, channels caption data and some others user defined settings will be erased.

IMPORTANT NOTE:
Always Exit the Service Mode
Following Adjustments.

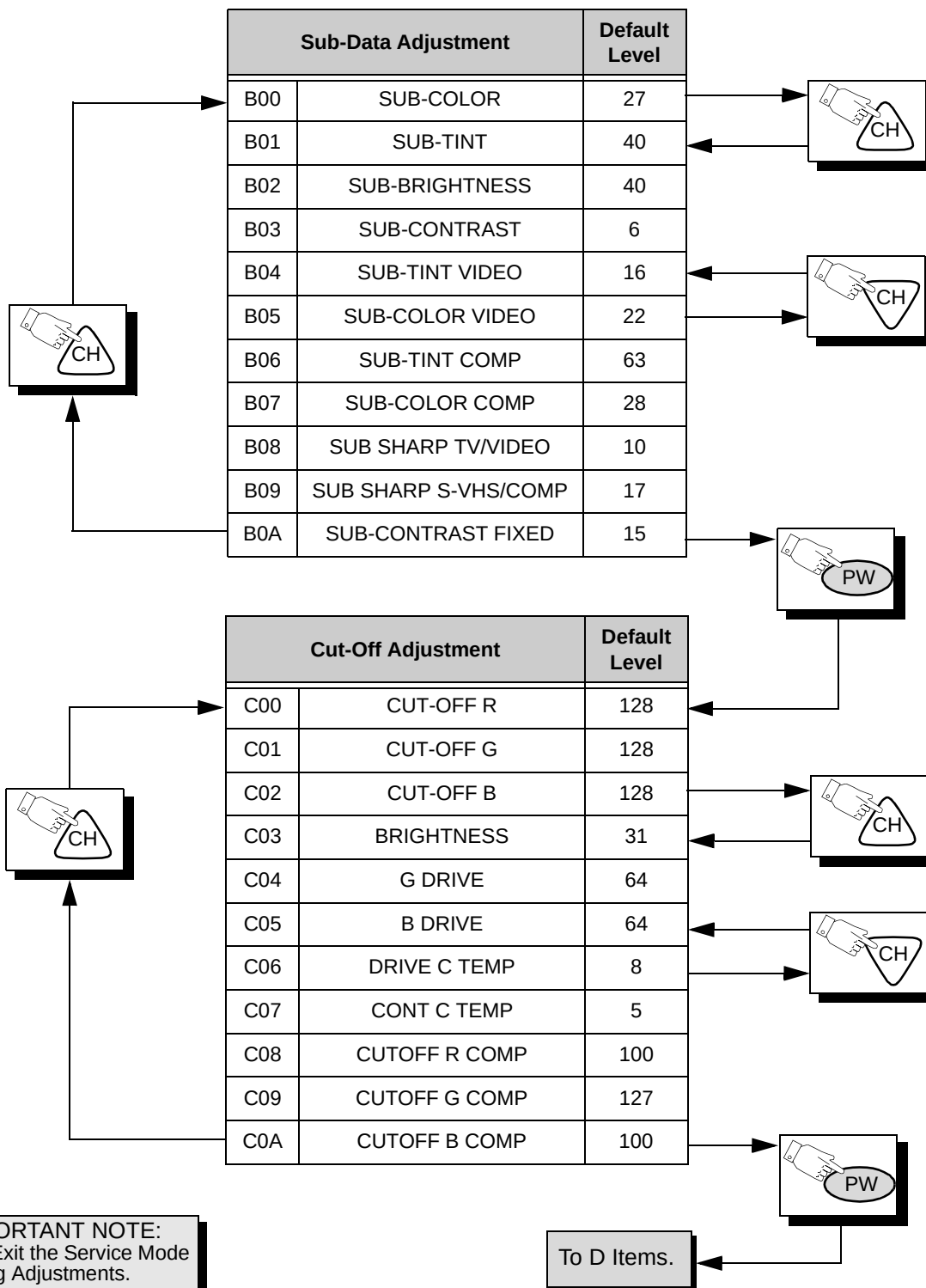
Press the **Power Button** on the **Remote Control** to select the Service Adjustment.

For Adjustments:

1. Press **Channel Up/Down** on the **Remote Control** to select one of the available Service Adjustments (**a** in Fig. 20).

Note: Write Down the original value set (**b** in Fig. 20) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

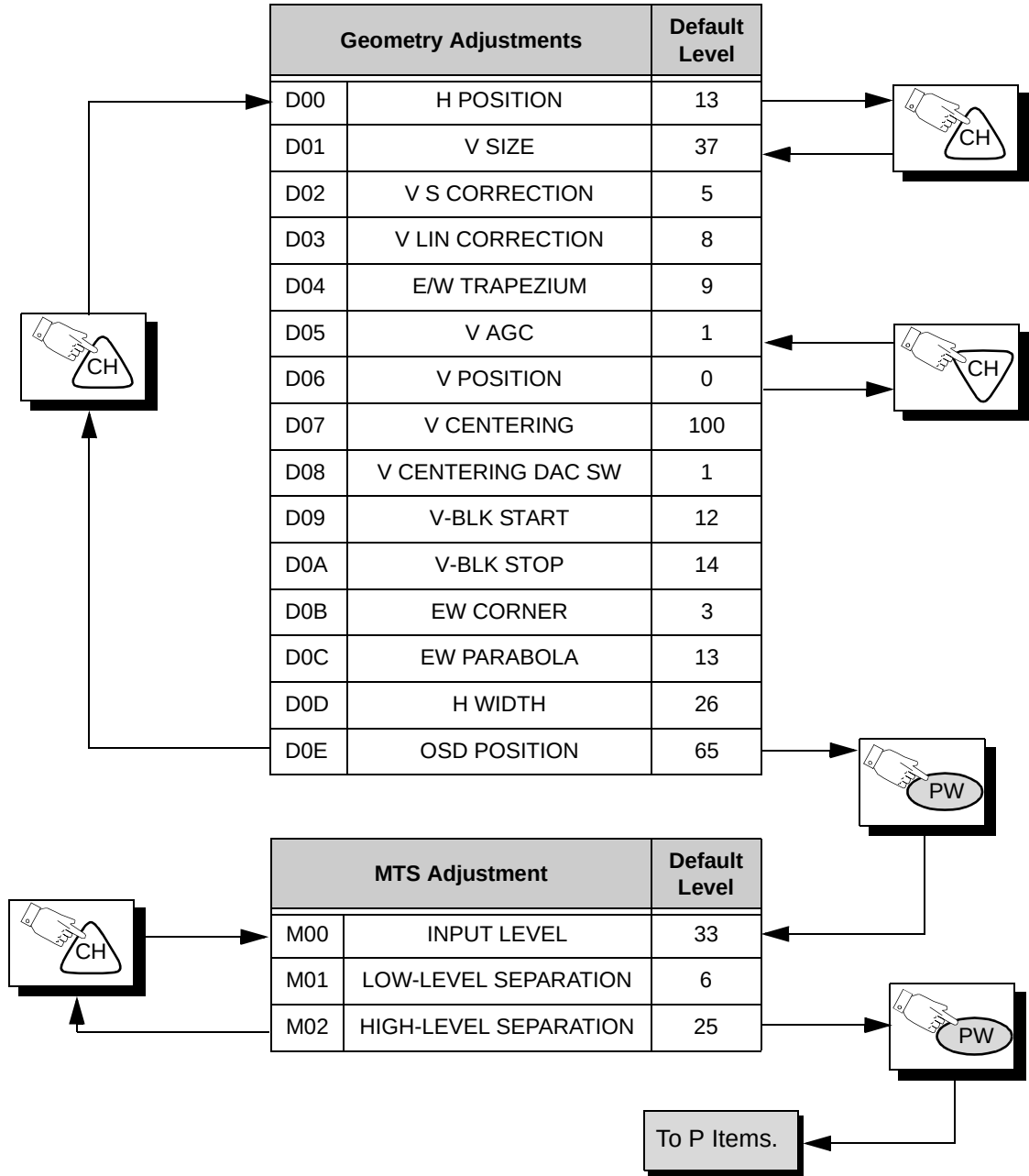
2. Press **Volume Up/Down** on the **Remote Control** to adjust the level of the selected Service Adjustment (**b** in Fig. 20).



Press the Power Button on the Remote Control to select the Service Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 20).
- Note: Write Down the original value set (b in Fig. 20) for each address before modifying anything. It is easy to erroneously adjust the wrong item.*
2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 20).



Note: Some adjustment modes may not be available in some formats.

IMPORTANT NOTE: Always Exit the Service Mode Following Adjustments.

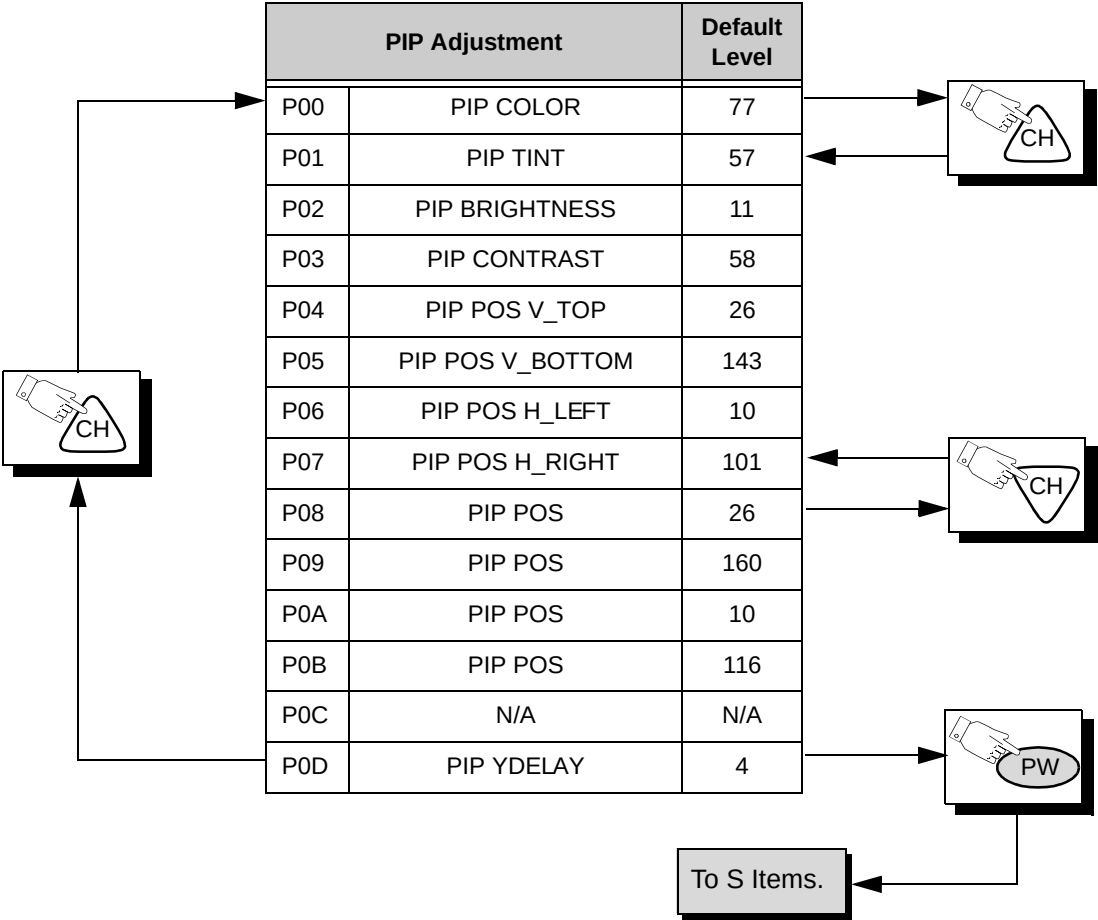
Press the Power Button on the Remote Control to select the Service Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 20).

Note: Write Down the original value set (b in Fig. 20) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 20).



Note: Some adjustment modes may not be available in some formats.

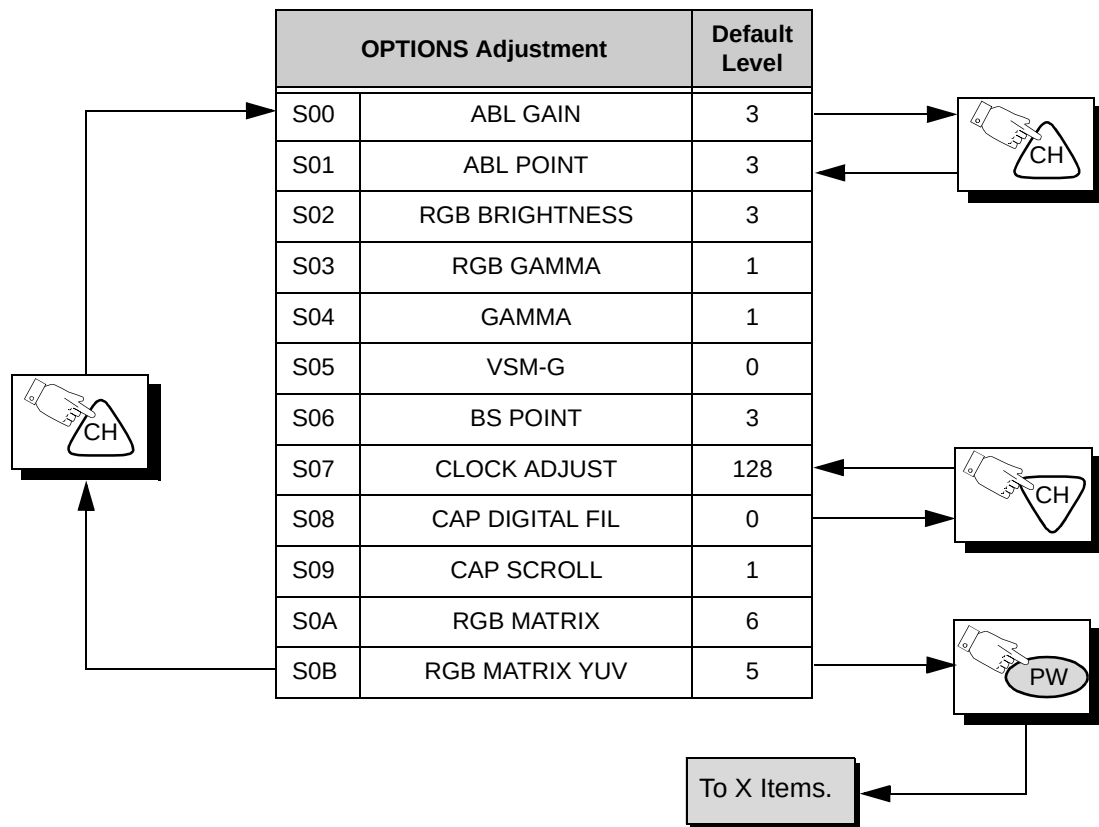
Press the Power Button on the Remote Control to select the Service Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 20).

Note: Write Down the original value set (b in Fig. 20) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 20).



IMPORTANT NOTE:
Always Exit the Service Mode
Following Adjustments.

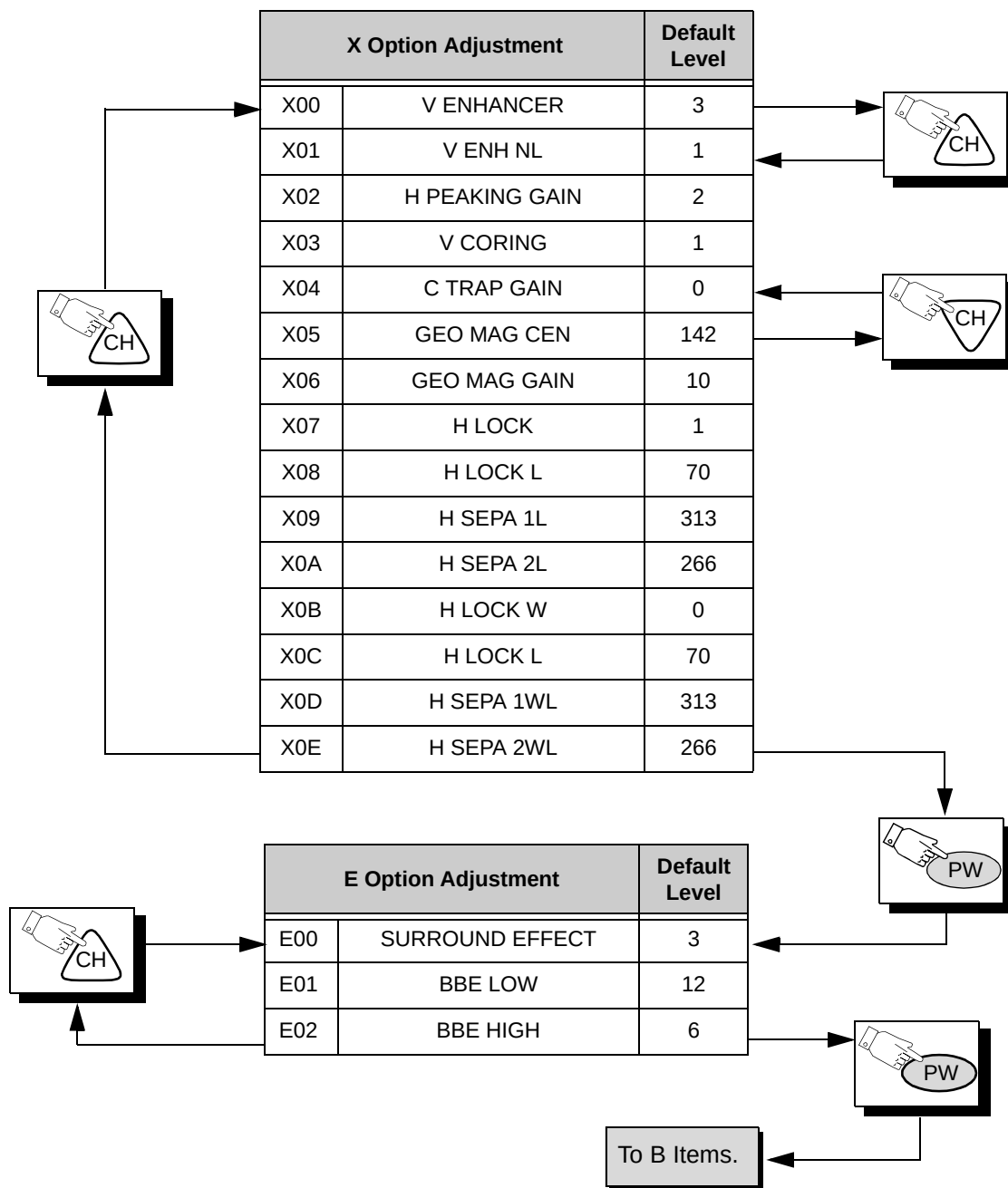
Press the Power Button on the Remote Control to select the Service Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 20).

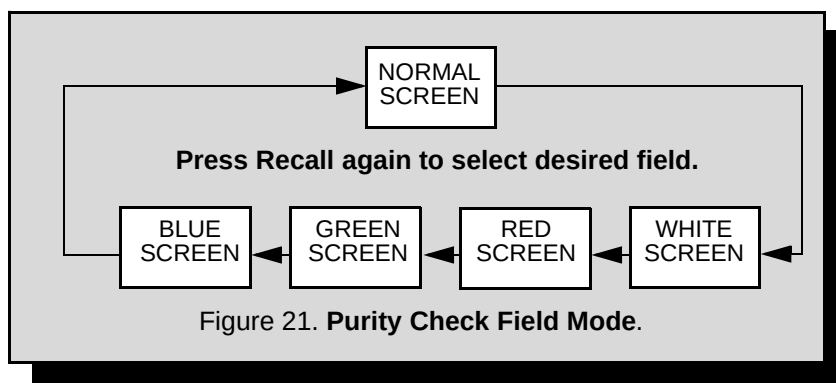
Note: Write Down the original value set (**b** in Fig. 20) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 20).



To Check Purity:

Press the **Recall** Button on the **Remote Control** when in Service Mode (red “CHK” is displayed) to enter the Purity Field Check Mode.



Helpful Hints

Entering Service Mode (Back-Open Method)

1. While the Receiver is ON or Plugged and operating in Normal Mode, momentarily short test point **FA1** (TP8) to Cold Ground ($\nearrow$) **FA2** (TP3) A-Board.

The Receiver enters the Aging Mode.

Yellow letters “CHK” appear in the upper left corner of the CRT.

(The Volume Up/Down will adjust rapidly).

2. Simultaneously press the **Action** and the **Volume Up** buttons on the **Receiver** Control Panel.

The Receiver enters the Service Mode.

The letter in “CHK” turn red.

(The Volume Up/Down will adjust normally).

(All customer controls are set to nominal level).

IMPORTANT NOTE:
Always Exit the Service Mode
Following Adjustments.

Instructional Flow Chart for Service Mode

IMPORTANT NOTE:
Always Exit the Service Mode
Following Adjustments.

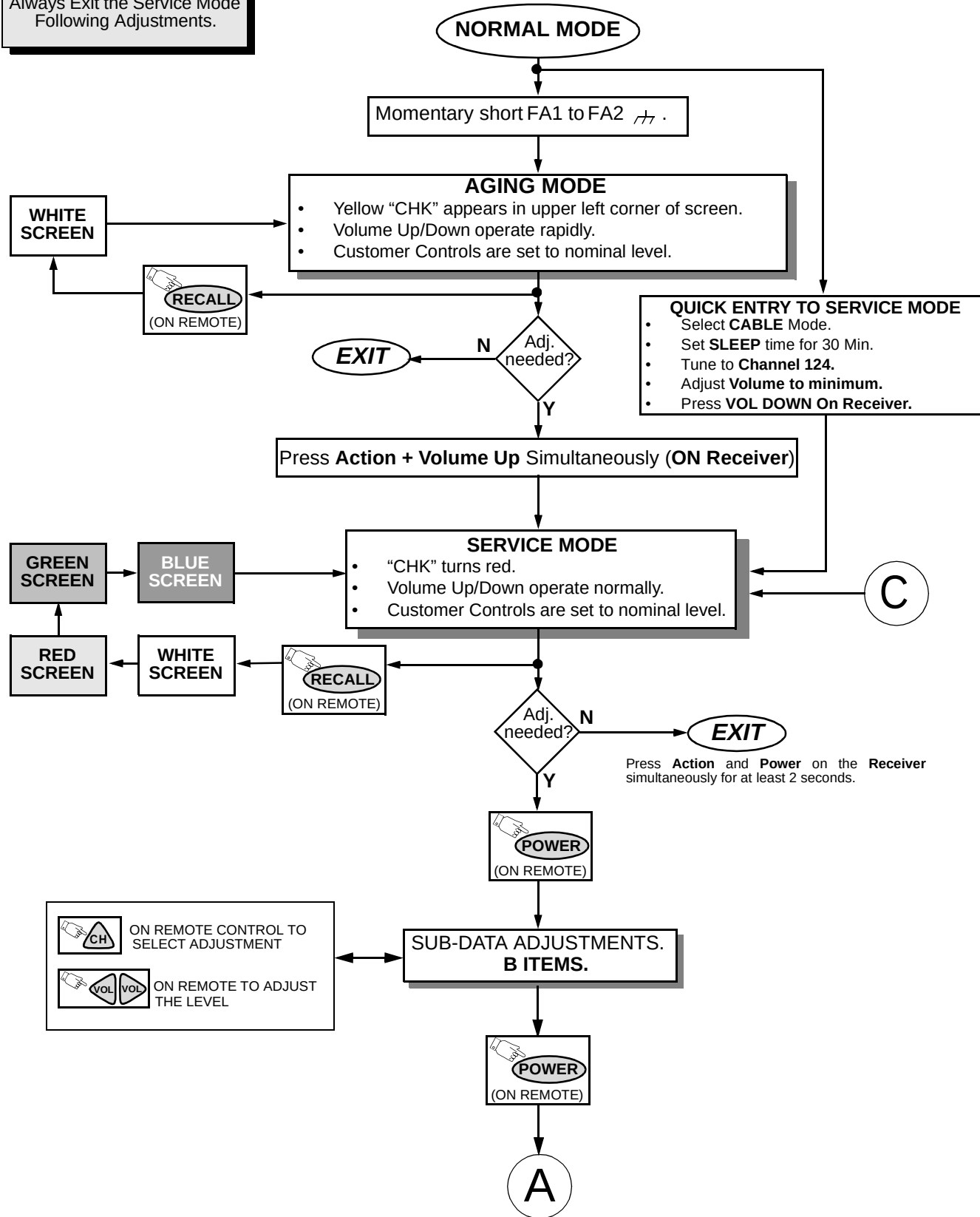
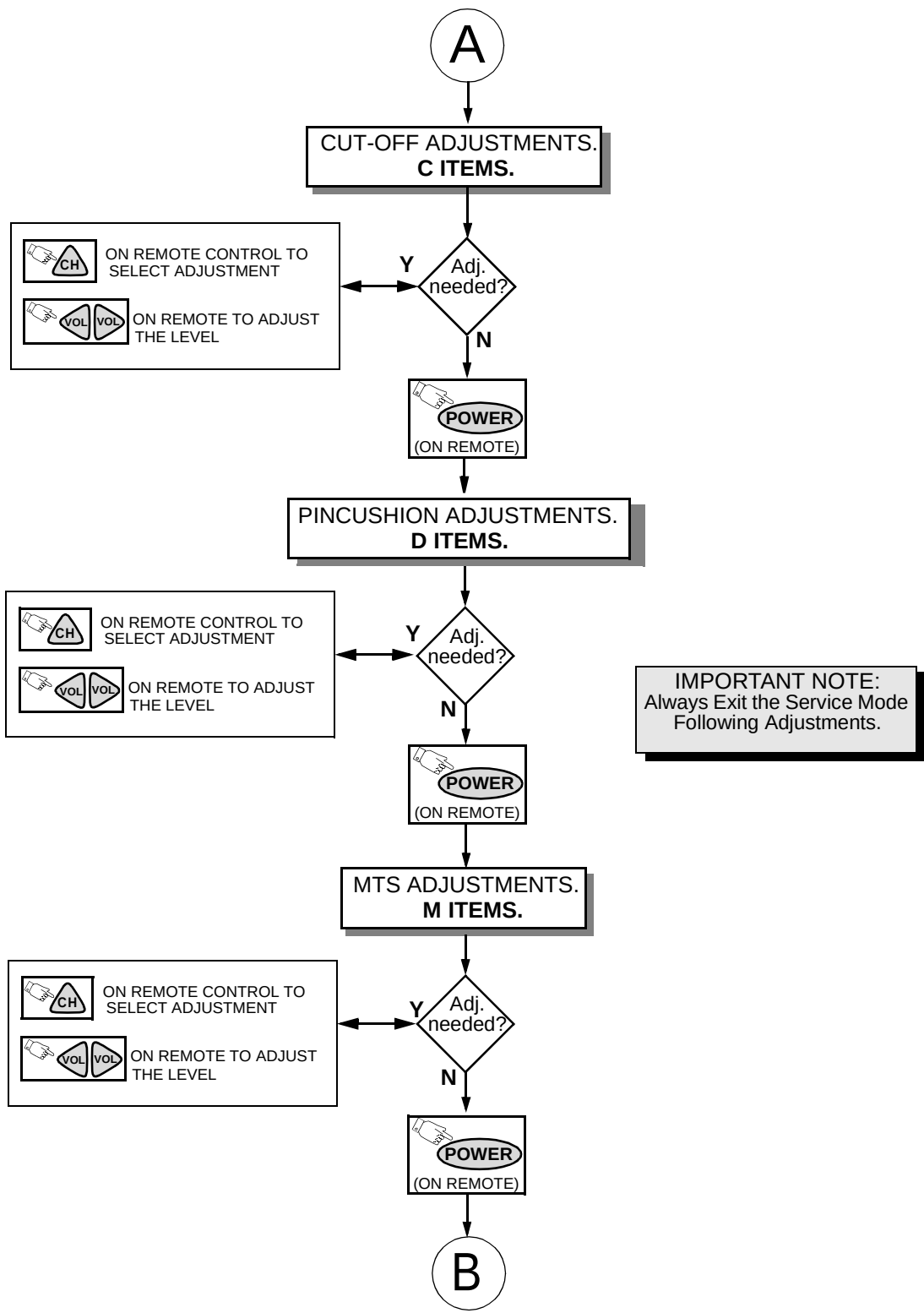
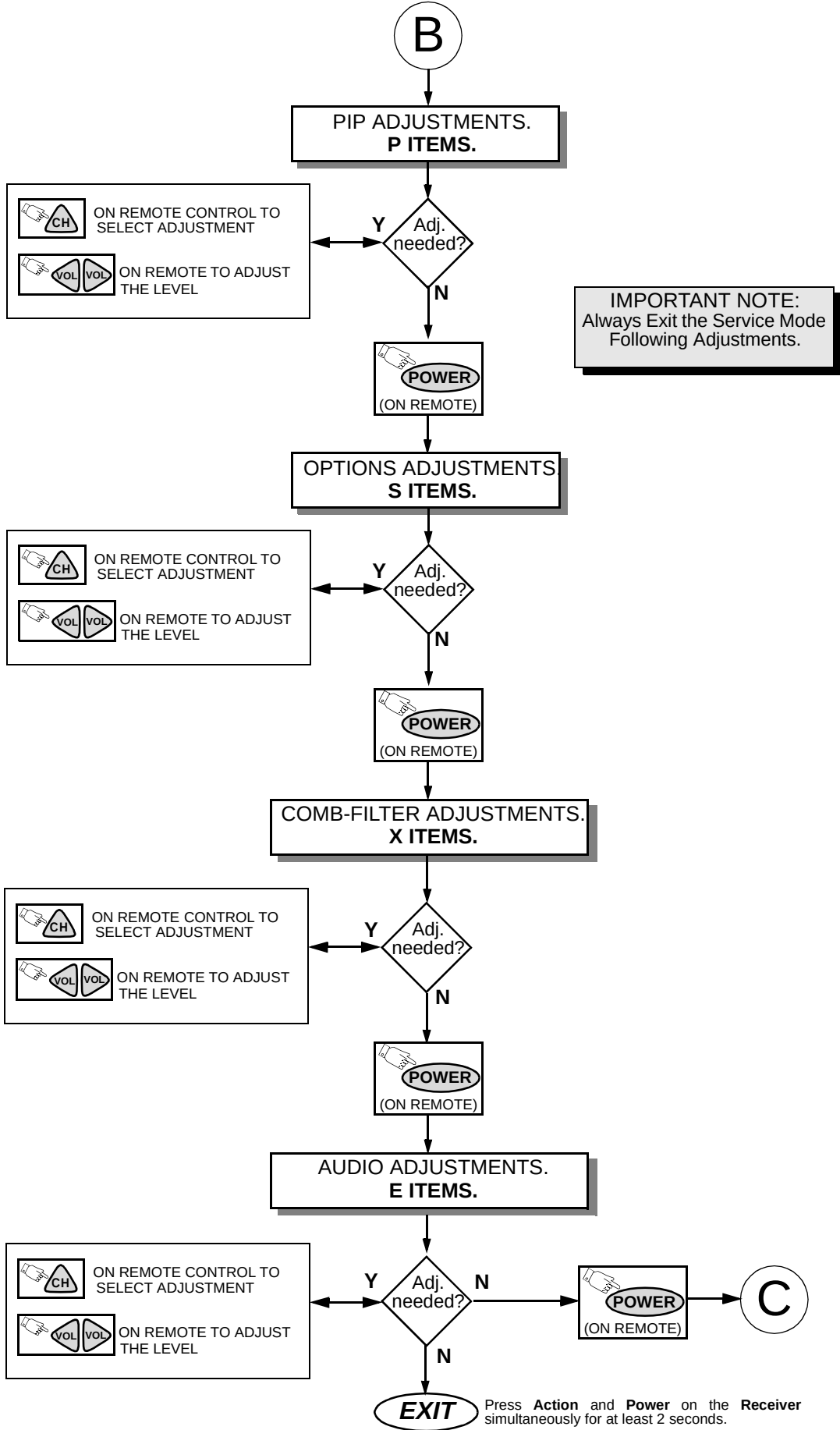


Figure 22. Flow Chart for Service Mode.

Instructional Flow Chart for Service Mode - Continued



Instructional Flow Chart for Service Mode - Continued



Service Adjustments (Electronic Controls)

Sub-Contrast Adjustment

Service DAC Adjustment (B02, B03)

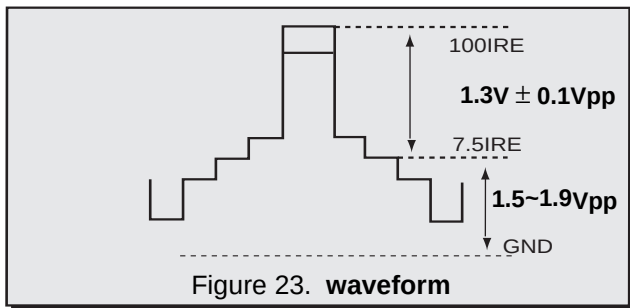
This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

Preparation:

1. Apply a Black-White pattern.
2. Preset the following controls:
 - Brightness Center.
 - Color Min.
 - Tint Center.
 - Picture Max.
 - Sharpness Center.
3. RGB GAMMA (S03) DAC from 1 to 0
4. Connect the oscilloscope to TP47R.
5. Connect a jumper from TPD2 to cold ground (↯).

Procedure:

1. In the Service Mode, select DAC B2 for Sub-Brightness to obtain 1.5V~1.9Vpp between 7.5IRE and GND level at TP47R (See Fig. 23)
2. In the Service Mode, select DAC B03 for Sub-Contrast to obtain $1.3 \pm 0.1V_{pp}$ between 7.5IRE and 100IRE level at TP47R
3. Remove short jumper and set RGB GAMMA (S03) DAC to 1.
4. Set the picture settings to normal.



Sub-Brightness (B02)

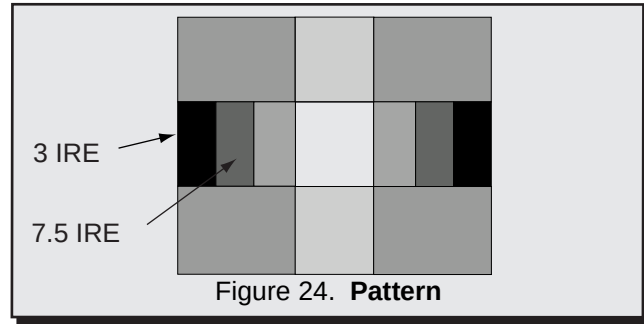
Adjustment of this control is important for setting proper operation of customer brightness and picture controls. **Do not adjust** the SCREEN VR after the Sub-Brightness is set.

Preparation:

1. Normalize picture settings.
2. Switch COLOR TEMPERATURE to NORMAL.

Procedure:

1. Apply a black white cross pattern.
2. In the Service Mode for making electronic adjustments, select the DAC adjustment (B02) and adjust data so that 7.5IRE part is the same light output as the 3IRE part (See Fig. 24).



Tint/Color Adjustment

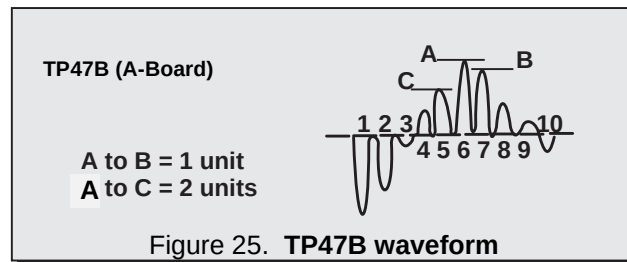
Service DAC Adjustment (B01) (B00)

Preparation:

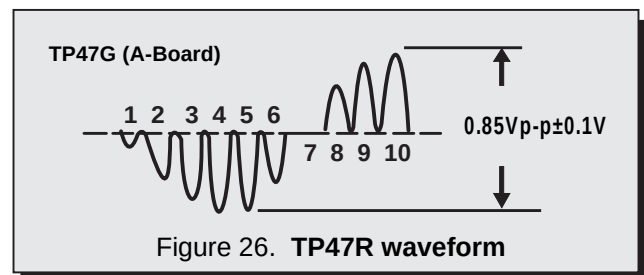
1. Apply a rainbow color bar signal.
2. Preset the following controls:
 - Brightness Min.
 - Color Center.
 - Tint Center.
 - Picture Max.
 - Sharpness Min.
3. Set RGB GAMMA (S03) DAC to 0
4. Connect a jumper from TPD2 to GND (↯).

Procedure:

1. Connect the oscilloscope to TP47B (A-Board).
2. In the Service Mode, select (B01) DAC Sub-Tint Adjustment. Adjust until the waveform measured is as the one shown in Fig. 25.



3. Connect the oscilloscope to TP47R (TPL1) and cold GND.
4. Select DAC Sub-Color Adjustment (B00) and adjust for peak to peak amplitude to be $0.85V_{p-p} \pm 0.1V$ as shown in Fig. 26.



5. Remove short jumper and set RGB GAMMA (S03) DAC to 1.

PIP Sub-Contrast Adjustment (P03)

Procedure:

1. Connect the oscilloscope to TPY1.
2. Apply a color bar signal in main and PIP (PIP on).
3. In the Service Mode, select the DAC adjustment (P03) for PIP Sub-contrast so that child (PIP) level is 90% of parent (MAIN) signal (See Fig. 27)

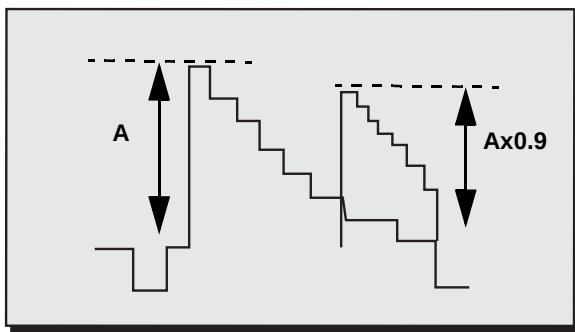


Figure 27. Waveform

Color Temperature Adjustment (B/W Tracking)

Service DAC Adjust.

(C00) (C01) (C02) (C04) (C05)

Minor Touch-Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good gray scale and warm highlights".

1. LOW LIGHT areas – In Service Mode for making electronic adjustments, select Cutoff (C00) RED, (C01) GRN, (C02) BLU and adjust the picture for gray.
2. HIGH LIGHT areas – In Service Mode for making electronic adjustments, select Drive (C04) GRN, (C05) BLU and adjust the picture for warm whites.

Complete Adjustment

Preparation:

1. Turn the Receiver "ON" and allow 30 minutes warm up at high brightness.
2. Apply a color bar signal with color "OFF".
3. Turn the SCREEN control (part of FBT T551) fully counterclockwise.

Procedure:

Preset the following Service DACs for best results:

- C0 128
- C1 128
- C2 128
- C4 64
- C5 64

1. Connect the oscilloscope to TPL1 (C-Board).
2. In Service Mode, select the Sub-Bright DAC (B02).
3. Press the R-Tune key on the remote.

4. Observe the oscilloscope waveform at Horizontal rate and adjust the Service Mode Sub-Bright DAC (B02) level until a scanning period of **2.4V** above DC ground is measured, as indicated in Fig. 28.

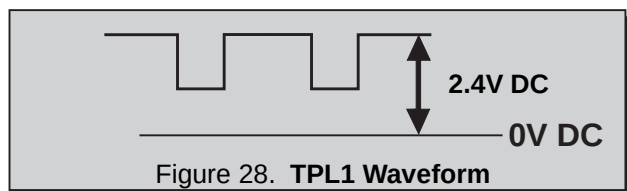


Figure 28. TPL1 Waveform

5. Press the R-Tune key on the remote.
6. Connect the scope to RED Cathode (KR) on the CRT-Board.
7. In the Service Mode, select the RED CUTOFF DAC (C00).
8. Press the R-Tune key on the remote.
9. View scope trace at Horizontal rate and adjust the Service Mode DAC (C00) level until a scanning period of **170V** above DC ground is measured, as indicated in Fig. 29.
10. Press the R-Tune key on the remote.
11. Write the same C00 data to C01 and C02.
12. Press the R-Tune key on the remote.
13. Turn the Screen Control (part of FBT) slowly clockwise until a slightly color horizontal line appears.
14. Adjust DAC C01 and C02 until the horizontal line becomes white.
15. Press the R-Tune key on the Remote

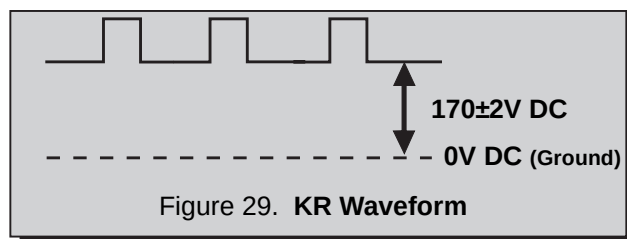


Figure 29. KR Waveform

16. In the Service Mode select the DAC DRIVE adjustments (C04) GRN, (C05) BLUE and adjust for warm white in a white color bar pattern.
17. Apply a monoscope pattern and check for a good picture.
18. Perform Minor Touch-Up Method if necessary.
19. EXIT the Service Mode.

Service Adjustments (Electronic Controls, cont.)

Horizontal Centering (D00)

This Adjustment helps to center the picture horizontally

Preparation:

Connect a monoscope pattern signal.

Procedure:

1. In the Service Mode, select the Horizontal Centering Adjustment DAC (D00) and adjust until the center of the monoscope pattern is centered on CRT.
2. EXIT the Service Adjustment Mode.

H-Size Adjustment (D0D)

Preparation:

1. Apply a Monoscope pattern

Procedure:

1. Adjust "D0D" DATA so that width "A" and "B" becomes 5.00 ± 0.40 approx (when using factory pattern). See Fig. 30

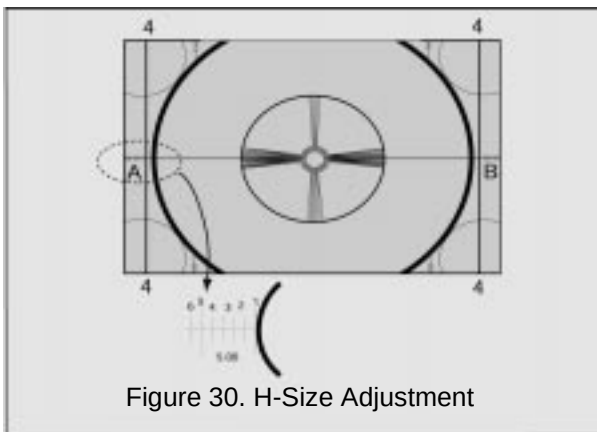


Figure 30. H-Size Adjustment

When using a different pattern, correlate with factory pattern.

2. If correlation is not possible, adjust D0D to obtain a perfect round pattern.

E-W PCC Adjustment (D0C)

This adjustment helps to correct left and right sides of picture.

Preparation:

1. Apply a Crosshatch pattern
2. Normalize the Picture Icon Video adjustments.

Procedure:

1. Adjust "D0C" DATA so that the 1st line and 3rd line make a good balance (See Fig. 31).

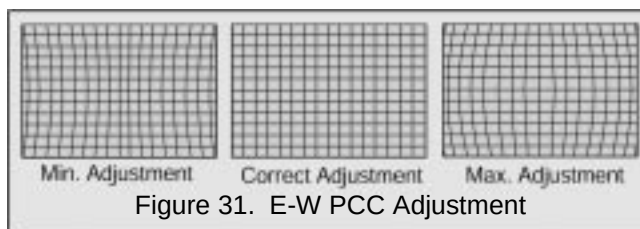


Figure 31. E-W PCC Adjustment

Corner PCC Adjustment (D0B)

Preparation:

1. Apply a Crosshatch pattern
2. Normalize the Picture Icon Video adjustments.

Procedure:

1. To adjust upper and lower linearity.
2. Adjust "D0B" to straighten upper and lower lines (See Fig. 32)

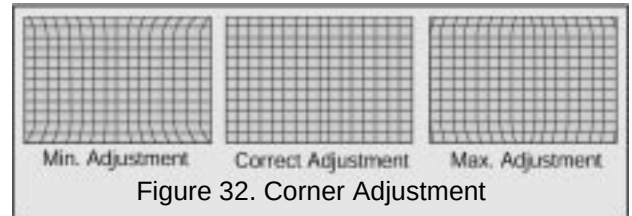


Figure 32. Corner Adjustment

V-Size and V-Position Adjustment (D01 & D07)

Preparation:

1. Apply a Crosshatch pattern.

Procedure:

1. Apply a monoscope pattern.
2. Enter Service Mode
5. Adjust (D07) to center the picture to the marks on the CRT.
5. Adjust (D01) to make circle of monoscope pattern a round circle.

V-Linearity Adjustment (D03)

Preparation:

1. Apply a Crosshatch pattern

Procedure:

1. Enter Service Mode, Adjust linearity data "D03" so that interval of "a" is same as "b" ($a=b$). (See Fig. 33)

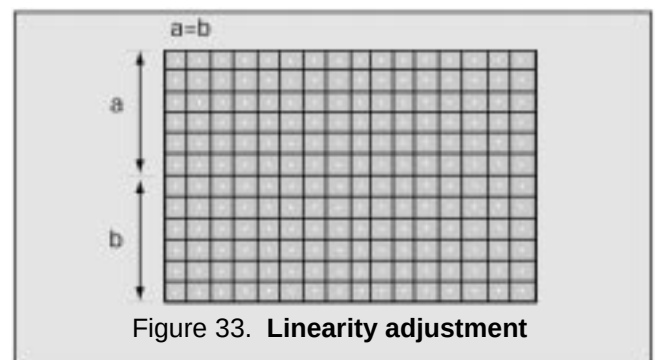


Figure 33. Linearity adjustment

V-Correction Adjustment (D02)

Preparation:

1. Apply a Crosshatch pattern.
2. Adjust (D01) so that V-Size is regular size.
3. If $b-a < -1.5\text{mm}$ (in top and bottom), increase (D02) by one step and adjust (D01) so that V-Size is regular; repeat steps until $b-a \leq 1.5\text{mm}$
4. If $b-a > 1.5\text{mm}$ (in top and bottom), decrease (D02) by one step and adjust (D01) so that V-Size is regular; repeat steps until $b-a \leq 1.5\text{mm}$.

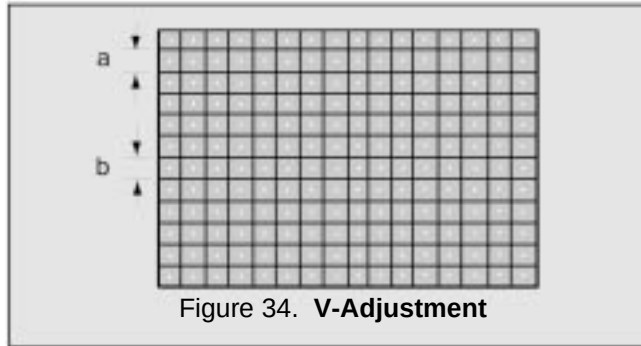


Figure 34. V-Adjustment

MTS Circuit Adjustments

The MTS Circuit Adjustments require two steps:

1. Input Level Adjustment.
2. Stereo Separation Adjustment.

Input Level Adjustment (M00)

Preparation:

1. Connect an RMS meter with filter jig as shown in Fig. 35.

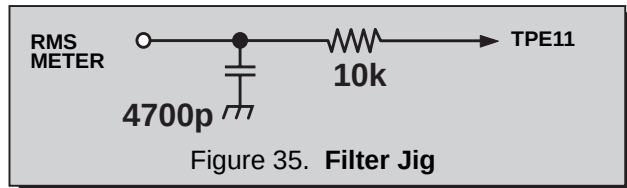


Figure 35. Filter Jig

2. Connect an RF signal generator to the RF antenna input.

Procedure:

1. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 300Hz, 100% modulation, monaural ($70 \pm 5\text{dB}$, 75Ω OPEN, P/S 10dB).
2. Adjust the MTS Input Level Adjustment (M0) until the voltage measured is $106 \pm 6.0\text{mV rms}$.

Stereo Separation Adjustment (M01 & M02)

Preparation:

1. Connect an RF signal generator to the RF antenna input.
2. Connect oscilloscope to TPE10.

Procedure:

1. Select Stereo Mode in Audio menu
2. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 300Hz, 100% modulation, stereo (left only) ($70 \pm 5\text{dB}$, 75Ω OPEN, P/S 10dB).
3. Adjust the MTS Low-Level Separation Adjustment (M01) until the amplitude displayed on the scope is minimum.
4. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 3KHz, 100% modulation, stereo (left only) ($70 \pm 5\text{dB}$, 75Ω OPEN, P/S 10dB).
5. Adjust the MTS High-Level Separation Adjustment (M02) until the amplitude displayed on the scope is minimum.
6. Repeat above steps 2 through 5 until the amplitude is minimum for both signals.

Service Adjustments (Electronic Controls, cont.)

Clock Adjustment (S07)

Preparation:

Connect the frequency counter to TPS1 (IC001 pin-13) and cold ground ($\rightarrow$).

Note: *Frequency Counter probe capacitance should be 8pF or less.*

Procedure:

1. Measure TPS1 (IC001 pin 13) for the frequency of the waveform and record the reading.

Note: *Pin 13 measurement must have at least four digits of resolution following the decimal point.
Example: 000.0000*

2. Place the Receiver into Service Mode for making electronic adjustment, select the Clock Adjustment DAC (S07).

3. Calculate and set S07 based on the following formula:

$$S07 = 128 + \{873.90625 - pin13[Hz]\}968$$

Figure 36. Set Turned ON

$$S07 = 128 + \{218.47656 - pin13[Hz]\}3873$$

Figure 37. Set Turned OFF

Note: *Pin 13 measurement will not change regardless of the value stored in S07.*

Service Adjustments (Mechanical Controls)

Focus (part of T551)

This adjustment is to make the picture clear

Preparation:

Connect a Signal generator and select a dot pattern.

Procedure:

Adjust the FOCUS controls to obtain the sharpest and clearest dot pattern.

- a. Adjust VF1 to minimize width on vertical lines on corners.
- b. Adjust VF2 to minimize width on horizontal lines on corners.

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Video Signal Path Block Diagram No-PIP Models

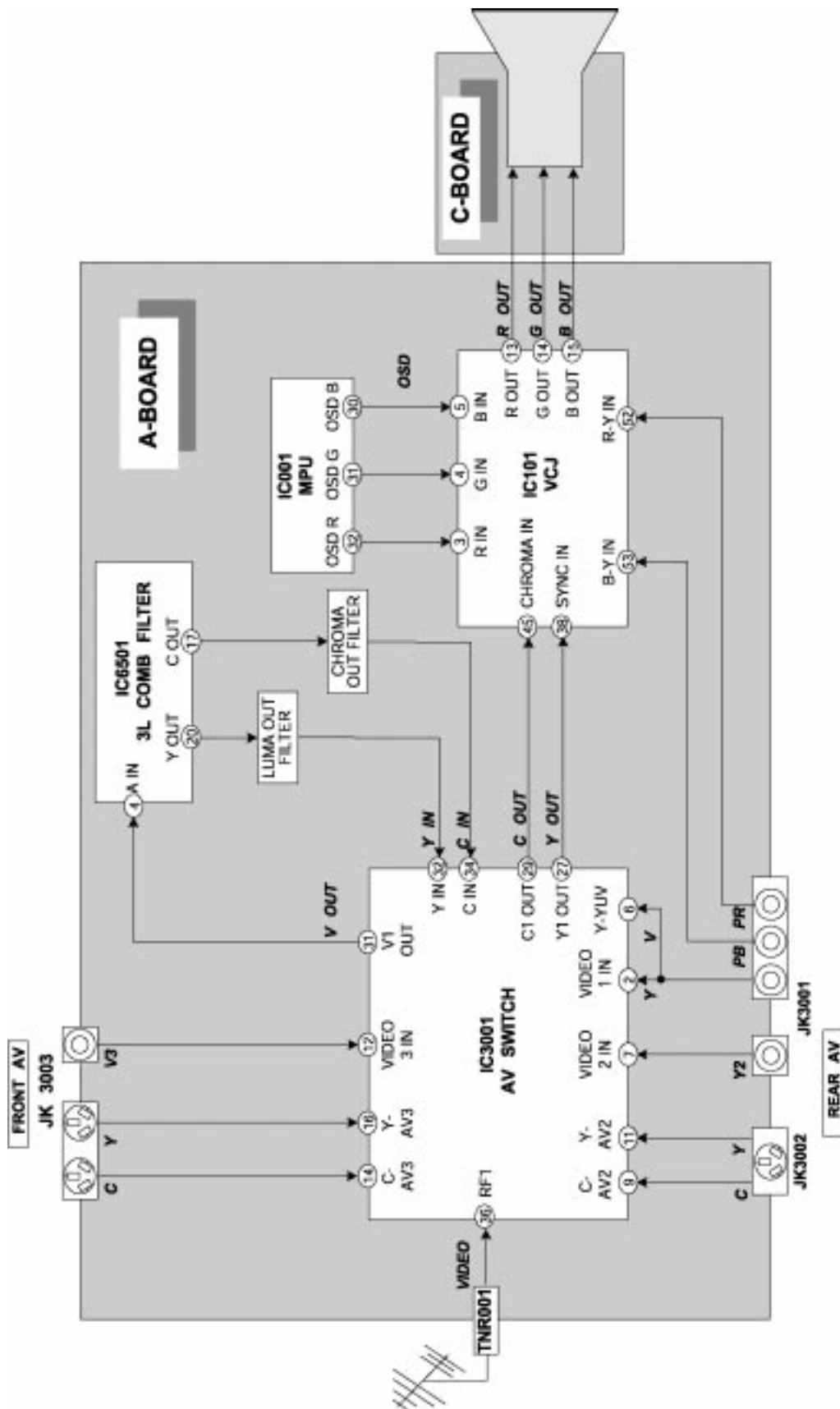


Figure 39. No-PIP Video Signal Path Block Diagram.

Video Signal Path Block Diagram 2-Tuner PIP Models

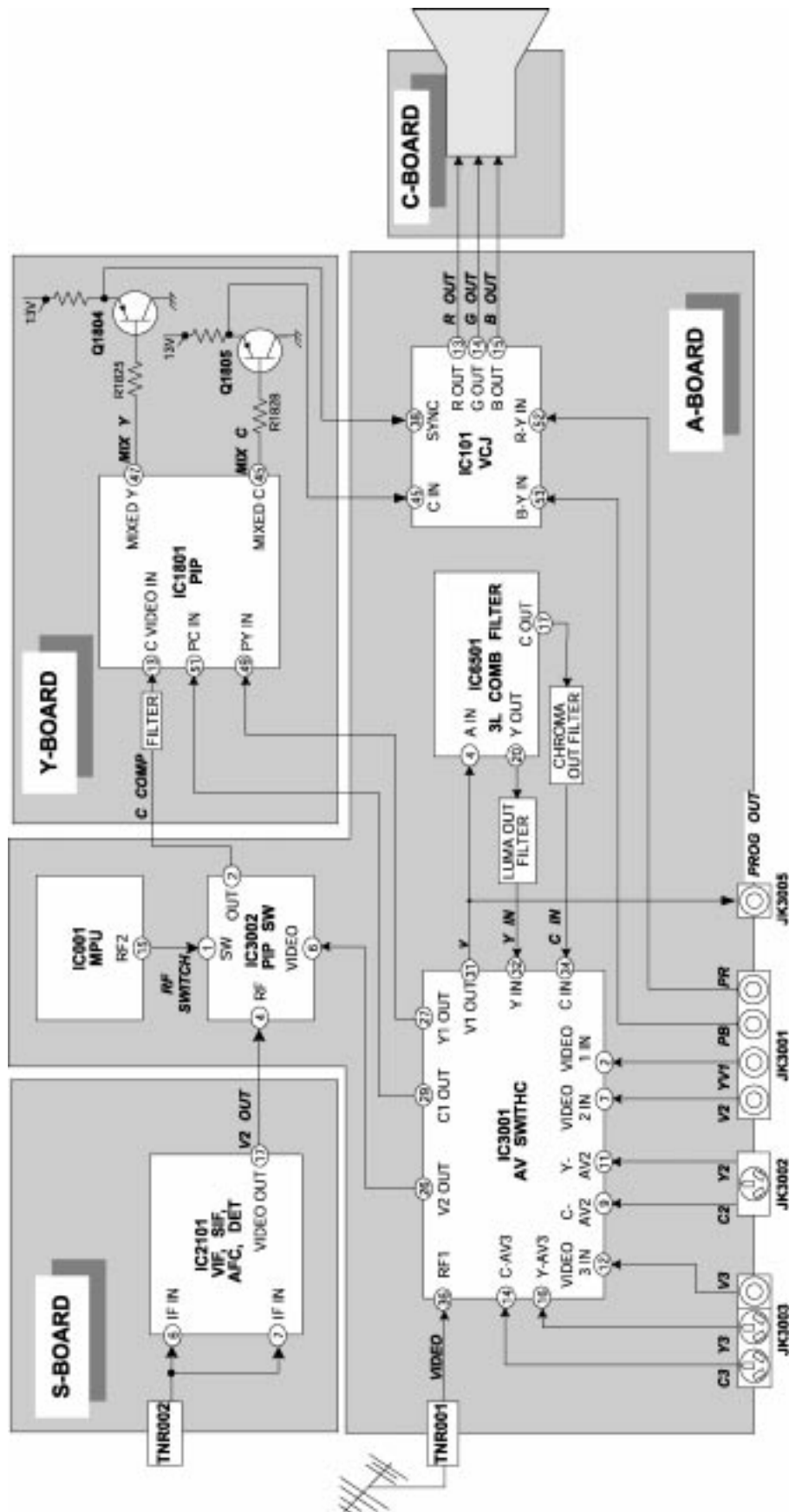


Figure 40. 2-Tuner PIP Video Signal Path Block Diagram.

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
CAPRISTORS		
CRA801	TP00842-51	TAPING GAP TERMINAL
CRA802	TP00842-51	TAPING GAP TERMINAL
CAPACITORS		
C001	ECA1CM470B	CAP,E 47UF/16V
C002	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C003	ECEA1HKA4R7B	CAP,E 4.7UF-50V
C005	ECA1CM470B	CAP,E 47UF/16V
C006	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C008	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C010	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C013	ECA0JM101B	CAP,E 100UF-6.3V
C014	TCJ2VC1H390J	CAP,C 39PF-J-50V
C015	TCJ2VC1H120J	CAP,C 12PF-J-50V
C017	TCJ2VC1H270J	CAP,C 27PF-J-50V
C018	TCJ2VC1H270J	CAP,C 27PF-J-50V
C020	ECA0JM331B	CAP,E 330UF-6.3V
C021	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C024	ECA1HM4R7B	CAP,E 4.7UF-50V
C025	ECA1HM010B	CAP,E 1UF-50V
C026	ECA1HM010B	CAP,E 1UF-50V
C032	ECA1CM331B	CAP,E 330UF-16V
C033	TCJ2VC1H680J	CAP,C 68PF-J-50V
C034	TCJ2VC1H680J	CAP,C 68PF-J-50V
C043	ECA1HM2R2B	CAP,E 2.2UF-50V
C044	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C047	ECA0JM102B	CAP,E 1000UF-6.3V
C048	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C052	TCJ2VC1H101J	CAP,C 100PF-J-50V
C053	ECA1HM010B	CAP,E 1UF-50V
C081	ECA1HM010B	CAP,E 1UF-50V <i>CT-27SX31E/CE/UE</i>
C201	TCJ2VB1C104K	CAP,C .1UF-K-16V
C224	TCJ2VB1C104K	CAP,C .1UF-K-16V
C225	TCJ2VB1C104K	CAP,C .1UF-K-16V
C226	TCJ2VB1C104K	CAP,C .1UF-K-16V
C301	TCJ2VB1C104K	CAP,C .1UF-K-16V
C302	TCJ2VB1C104K	CAP,C .1UF-K-16V
C303	TCJ2VB1C104K	CAP,C .1UF-K-16V
C307	ECA1HM0R1B	CAP,E 0.1UF/50V
C309	TCJ2VC1H390J	CAP,C 39PF-J-50V <i>CT-27SX31E/CE/UE</i>
C310	TCJ2VC1H390J	CAP,C 39PF-J-50V
C314	EEANA1E1R0B	CAP,E 1.0UF-25V <i>CT-27SX31E/CE/UE</i>
C315	EEANA1E1R0B	CAP,E 1.0UF-25V
C320	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C321	TCJ2VB1H103K	CAP,C .01UF-K-50V
C322	TCJ2VB1H103K	CAP,C .01UF-K-50V
C323	TCJ2VB1H103K	CAP,C .01UF-K-50V
C324	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C330	ECA1AM101B	CAP,E 100UF-10V

REF NO.	PART NO.	DESCRIPTION
C331	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C337	ECA1HM2R2B	CAP,E 2.2UF-50V
C342	ECA1HM010B	CAP,E 1UF-50V
C351	TACCV470T50V	CAP,C 47PF/50V
C352	TACCV330T50V	CAP,C 33PF/50V
C353	TACCV330T50V	CAP,C 33PF/50V
C359	ECQM4104KZB	CAP,P .10UF-K-400V
C368	ECQV1H224JL3	CAP,P .22UF-J-50V
C370	ECKW3D102KBN	CAP,C .001UF-K-2KVDC
C371	ECEA1HN010UB	CAP,E 1UF/50V
C373	ECA2EHG100B	CAP,E 10UF-250V
C377	ECA1CM221B	CAP,E 10UF-16V
C401	TCJ2VB1C104K	CAP,C .1UF-K-16V
C402	TCJ2VB1H102K	CAP,C 1000PF-K-50V
C403	ECA1HM010B	CAP,E 1UF-50V
C404	ECA1HM010B	CAP,E 1UF-50V
C405	ECSF1EE105VB	CAP,E 1.0UF-25V
C407	ECA1HM220B	CAP,E 22UF-50V
C409	TCJ2VC1H101J	CAP,C 100PF-J-50V
C410	TCJ2VB1C104K	CAP,C .1UF-K-16V
C415	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C453	EEUNA1E220B	CAP,E 22UF-25V
C454	ECA1HHG221B	CAP,E 220UF-50V
C456	ECQB1104JF3	CAP,P .10UF-J-100V
C458	ECKR1H221KB5	CAP,C 220PF-K-50V
C459	ECQB1224KF3	CAP,P .22UF-K-100V
C460	ECA1VM221B	CAP,E 220UF-35V
C461	ECA1VM470B	CAP,E 47UF/35V
C462	ECA1VM221B	CAP,E 220UF-35V
C463	ECQB1H103JM3	CAP,P .01UF-J-50V
C465	ECA1CM101B	CAP,E 100UF/16V
C470	ECQB1H104JM3	CAP,P .1UF-J-50V
C471	ECQB1H104JM3	CAP,P .1UF-J-50V
C495	ECQB1H683JM3	CAP,P .068UF-J-50V
C504	ECQB1H222JM3	CAP,P 2200PF-J-50V
C505	TCJ2VC1H180J	CAP,C 18PF-J-50V
C506	ECA1CM471B	CAP,E 470UF-16V
C507	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C511	ECKR2H271KB5	CAP,C 270PF-K-500V
C512	ECKR2H152KB5	CAP,C .0015UF-K-500V
C514	ECA1HMR22B	CAP,E .22UF-50V
C519	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C535	TCJ2VC1H120J	CAP,C 12PF-J-50V
C548	ECWH16103JVB	CAP,P .01UF-J-1.5KV
C549	ECQM4473JZW	CAP,P .063UF-J-100V
C550	ECA160V33UE	CAP,E 33UF/160V
C552	ECQM6332JZW	CAP,P .63UF-J-100V
C553	ECWF2754JBB	CAP,M .27UF-J-200V
C554	ECKW3D102JBR	CAP,C 1000PF-J-500V
C555	ECA160V33UE	CAP,E 33UF/160V

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
C556	ECWH20182JVY	CAP,P 1500PF-J-2KV
C557	ECA1CM100B	CAP,E 10UF-16V
C558	ECKW3D561JBR	CAP,C 560PF-K-2KV
C559	ECKW3D681KBP	CAP,C 680PF-K-2KV
C560	ECKR2H102KB5	CAP,C 1000PF-K-500V
C561	ECQB1H273JM3	CAP,M .27UF-J-50V
C562	ECKR2H471KB5	CAP,C 470PF-K-500V
C563	ECA1EM102E	CAP,E 1000UF-25V
C564	ECKR2H471KB5	CAP,C 470PF-K-500W
C565	ECA1EM102E	CAP,E 1000UF-25V
C566	ECKR2H471KB5	CAP,C 470PF-K-500W
C567	ECA1CM471B	CAP,E 470UF-16V
C569	ECWF23044JBB	CAP,P .27UF-J-200V
C570	ECA2EM220E	CAP,E 22UF-250V
C571	ECKR2H102KB5	CAP,C 1000PF-K-500V
C572	ECWF2334JBB	CAP,P .33UF-J-200V
C573	ECQE2474KFW	CAP,P .47UF-K-200V
C580	ECA1HM4R7B	CAP,E 4.7UF-50V
C581	ECA1CM471B	CAP,E 470UF-16V
C582	ECA1CM101B	CAP,E 100UF/16V
C583	ECA1CM100B	CAP,E 10UF-16V
C593	ECEA1HNR47UB	CAP,E .47UF-50V
C595	ECA1HM100B	CAP,E 10UF/50V
C601	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C603	ECQB1H223JM3	CAP,P .022UF-J-50V
C616	TCJ2VB1C104K	CAP,C .1UF-K-16V
C619	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C628	TCJ2VC1H151J	CAP,C 150PF-J-50V
C632	TCJ2VB1H103K	CAP,C .01UF-K-50V
C641	ECA1CM100B	CAP,E 10UF-16V
C701	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C750	TCJ2VC1H181J	CAP,C 180PF-J-50V
C751	ECQE1335KFB	CAP,P 3.3UF-K-100V
C752	ECA1VM470B	CAP,E 47UF/35V
C753	ECQB1H222JM3	CAP,P 2200PF-J-50V
C754	TCJ2VB1H332K	CAP,C .0033UF-K-50V
C755	TCJ2VB1H273K	CAP,C .027UF-K-50V
C756	ECKR2H332KB5	CAP,C 3300PF-K-550V
C763	ECKR3A121KBP	CAP,C 120PF-K-1KV
C801	ECKWAE472ZED	CAP,C 4700PF-Z-500V
C802	ECKWAE472ZED	CAP,C 4700PF-Z-500V
C803	ECKWAE472ZED	CAP,C 4700PF-Z-500V
C804	ECKWAE472ZED	CAP,C 4700PF-Z-500V
C805	EC0S2DA561BB	CAP,E 560PF-200V
C806	ECQB1H104JM3	CAP,P .1UF-J-50V
C807	ECQB1H103JM3	CAP,P .01UF-J-50V
C809	ECKR3A222KBP	CAP,C .0022UF-K-1KV
C812	ECQU2A224MVA	CAP,P .22UF-M-250VAC
C813	ECQU2A153MVA	CAP,P .015UF-M-250VAC
C814	ECQU2A153MVA	CAP,P .015UF-M-250VAC

REF NO.	PART NO.	DESCRIPTION
C815	ECQB1H104JM3	CAP,P .1UF-J-50V
C816	ECQB1H473JM3	CAP,P .047UF-J-50V
C817	ECQU2A224MVA	CAP,P .22UF-M-250VAC
C818	ECQB1H103JM3	CAP,P .01UF-J-50V
C819	ECKCNB102MB	CAP,C 1000PF-M-250V
C820	ECKCNB102MB	CAP,C 1000PF-M-250V
C821	ECA1HM471E	CAP,E 470UF-50V
C822	ECKR3A471KBP	CAP,C 470PF-K-1KV
C823	ECA1CHG101B	CAP,E 100UF-16V
C824	ECKR3A821KBP	CAP,C 820PF-K-1KV
C825	EEUMG2C221S	CAP,E 220UF-160V
C826	ECKR3A821KBP	CAP,C 820PF-K-1KV
C827	ECA1CM102B	CAP,E 1000UF/16V
C828	ECKR1H471KB5	CAP,C 470PF-K-50V
C831	ECKR3A221KBP	CAP,C 220PF-K-1KV
C832	ECKR3A471KBP	CAP,C 470PF-K-1KV
C833	ECA1HM4R7B	CAP,E 4.7UF-50V
C835	ECA1EM101B	CAP,E 100UF-25V
C901	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C902	TCJ2VC1H561J	CAP,C 560PF-J-50V
C904	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C952	ECA1HM100B	CAP,E 10UF/50V
C953	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C958	ECA2CM470E	CAP,E 47UF-160V
C959	ECKW2H103ZF7	CAP,C .01UF-Z-500V
C960	ECCR2H151J5	CAP,C 150-500V
C961	ECA2AM100B	CAP,E 10UF-100V
C962	ECKW2H103ZF7	CAP,C .01UF-Z-500V
C963	ECCR1H151J5	CAP DISC 150-5-50V
C964	ECA1CHG101B	CAP,E 100UF-16V
C966	ECA1CHG101B	CAP,E 100UF-16V
C967	ECA1CM221B	CAP,E 10UF-16V
C968	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C969	ECKR1H103ZF5	CAP,C .01UF-Z-50V
C971	TACCW222T50V	CAP,C 2200PF/50V
C1801	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1802	ECQV1H154JM3	CAP,P .15UF-J-50V CT-27SX31E/CE/UE
C1803	ECA1HMR22B	CAP,E .22UF-50V CT-27SX31E/CE/UE
C1804	ECEA1HKAR22B	CAP,E .22UF-50V CT-27SX31E/CE/UE
C1805	TCJ2VF1H333Z	CAP,C .033UF-Z-50V CT-27SX31E/CE/UE
C1806	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1807	ECA1CM470B	CAP,E 47UF/16V CT-27SX31E/CE/UE
C1808	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1809	ECA1CM470B	CAP,E 47UF/16V CT-27SX31E/CE/UE

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
C1810	TCJ2VF1H104Z	CAP,C .1UF-Z-50V CT-27SX31E/CE/UE
C1811	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1812	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1813	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1814	ECA1CM470B	CAP,E 47UF/16V CT-27SX31E/CE/UE
C1815	TCJ2VF1H104Z	CAP,C .1UF-Z-50V CT-27SX31E/CE/UE
C1816	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1817	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1818	ECA1CM100B	CAP,E 10UF-16V CT-27SX31E/CE/UE
C1819	TCJ2VF1H104Z	CAP,C .1UF-Z-50V CT-27SX31E/CE/UE
C1820	ECA1CM470B	CAP,E 47UF/16V CT-27SX31E/CE/UE
C1821	TCJ2VC1H150J	CAP,C 15PF-J-50V CT-27SX31E/CE/UE
C1822	TCJ2VC1H120J	CAP,C 12PF-J-50V CT-27SX31E/CE/UE
C1823	TCJ2VC1H680J	CAP,C 68PF-J-50V CT-27SX31E/CE/UE
C1826	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1827	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1828	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C1829	TCJ2VF1H104Z	CAP,C .1UF-Z-50V CT-27SX31E/CE/UE
C1830	TCJ2VC1H560J	CAP,C 56PF-J-50V CT-27SX31E/CE/UE
C1831	TCJ2VF1H104Z	CAP,C .1UF-Z-50V CT-27SX31E/CE/UE
C1832	TCJ2VF1H104Z	CAP,C .1UF-Z-50V CT-27SX31E/CE/UE
C1833	TCJ2VF1H104Z	CAP,C .1UF-Z-50V CT-27SX31E/CE/UE
C1835	ECA1CM100B	CAP,E 10UF-16V CT-27SX31E/CE/UE
C1836	TCJ2VC1H680J	CAP,C 68PF-J-50V CT-27SX31E/CE/UE
C1837	TCJ2VF1H104Z	CAP,C .1UF-Z-50V CT-27SX31E/CE/UE
C1839	TCJ2VC1H680J	CAP,C 68PF-J-50V CT-27SX31E/CE/UE
C1840	TCJ2VC1H680J	CAP,C 68PF-J-50V CT-27SX31E/CE/UE
C2105	ECA0JM101B	CAP,E 100UF-6.3V
C2106	ECA1HMR47B	CAP,E .47UF-50V CT-27SX31E/CE/UE

REF NO.	PART NO.	DESCRIPTION
C2108	ECA1CM330B	CAP,E 33UF-16V CT-27SX31E/CE/UE
C2109	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C2111	ECEA1HFSR22B	CAP,E .22UF-50V CT-27SX31E/CE/UE
C2114	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C2115	ECA1HM100B	CAP,E 10UF/50V CT-27SX31E/CE/UE
C2116	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C2118	TCJ2VC1H270J	CAP,C 27PF-J-50V CT-27SX31E/CE/UE
C2119	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C2120	ECEA1HFSR47B	CAP,E .47UF-50V CT-27SX31E/CE/UE
C2121	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C2123	TCJ2VC1H270J	CAP,C 27PF-J-50V CT-27SX31E/CE/UE
C2124	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C2125	ECA1CM100B	CAP,E 10UF-16V CT-27SX31E/CE/UE
C2126	ECA1HMR22B	CAP,E .22UF-50V CT-27SX31E/CE/UE
C2202	ECA1HM2R2B	CAP,E 2.2UF-50V
C2203	ECA1HM4R7B	CAP,E 4.7UF-50V
C2204	AP106K016CAE	CAP,T 10UF/16V
C2205	ECA1HM010B	CAP,E 1UF-50V
C2206	ECQB1H223JM3	CAP,P .022UF-J-50V
C2207	AP335K016CAE	CAP,T 3.3UF/16V
C2208	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2209	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2210	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2211	ECA1CM100B	CAP,E 10UF-16V
C2212	ECQB1H473JM3	CAP,P .047UF-J-50V
C2215	ECA0JM101B	CAP,E 100UF-6.3V
C2218	ECA1HMR47B	CAP,E .47UF-50V
C2220	TCJ2VC1H100D	CAP,C 10PF-J-50V
C2302	ECA1HM010B	CAP,E 1UF-50V
C2305	ECA1HM010B	CAP,E 1UF-50V
C2307	ECA1EM102E	CAP,E 1000UF-25V
C2308	ECA1HM101B	CAP,E 100UF-50V
C2311	ECA1HM010B	CAP,E 1UF-50V
C2312	ECA1EM102E	CAP,E 1000UF-25V
C2313	ECA1VM102E	CAP,E 1000UF-35V
C2314	ECA1CM101B	CAP,E 100UF/16V
C2331	ECA1HM010B	CAP,E 1UF-50V
C2332	ECA1HM010B	CAP,E 1UF-50V
C2333	ECA1EM100B	CAP,E 10UF-25V
C2334	ECA1EM100B	CAP,E 10UF-25V

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

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REF NO.	PART NO.	DESCRIPTION
C2335	ECA1HM010B	CAP,E 1UF-50V
C2336	ECA1HM010B	CAP,E 1UF-50V
C2337	ECA1CM470B	CAP,E 47UF/16V
C2431	ECA1HM010B	CAP,E 1UF-50V
C2432	ECA1HM010B	CAP,E 1UF-50V
C2433	TCJ2VC1H222J	CAP,C 2200PF-J-50V
C2437	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2438	TCJ2VB1H102K	CAP,C 1000PF-K-50V
C2444	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2445	TCJ2VB1C104K	CAP,C .1UF-K-16V
C2449	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2450	TCJ2VB1H102K	CAP,C 1000PF-K-50V
C2451	ECEA1CN100UB	CAP,E 10UF-16V
C2459	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2460	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2461	ECA1HM4R7B	CAP,E 4.7UF-50V
C2462	ECA1HM4R7B	CAP,E 4.7UF-50V
C2463	ECEA1CN100UB	CAP,E 10UF-16V
C2464	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2465	TCJ2VB1H333K	CAP,C .033UF-K-50V
C2468	ECA1AM101B	CAP,E 100UF-10V
C2473	ECA1HM4R7B	CAP,E 4.7UF-50V
C2474	ECA1AM101B	CAP,E 100UF-10V
C2475	ECA1HM4R7B	CAP,E 4.7UF-50V
C3001	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3002	ECA1AM101B	CAP,E 100UF-10V
C3003	ECA1CM100B	CAP,E 10UF-16V
C3004	ECA1HM010B	CAP,E 1UF-50V
C3006	ECA1HM010B	CAP,E 1UF-50V
C3007	ECA1CM100B	CAP,E 10UF-16V
C3008	ECA1CM100B	CAP,E 10UF-16V
C3009	ECA1HM010B	CAP,E 1UF-50V
C3010	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3011	ECA1HM010B	CAP,E 1UF-50V
C3012	ECA1CM100B	CAP,E 10UF-16V
C3013	ECA1CM100B	CAP,E 10UF-16V
C3014	ECA1HM010B	CAP,E 1UF-50V
C3016	ECA1HM010B	CAP,E 1UF-50V
C3017	ECEA1CKA100B	CAP,E 10UF-16V CT-27SX31E/CE/UE
C3018	ECA1CM100B	CAP,E 10UF-16V
C3019	ECA1CM100B	CAP,E 10UF-16V
C3020	ECA1HM010B	CAP,E 1UF-50V
C3021	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3022	ECA1HM010B	CAP,E 1UF-50V
C3023	ECA1CM100B	CAP,E 10UF-16V
C3024	ECA1CM100B	CAP,E 10UF-16V
C3025	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3026	TCJ2VC1H820J	CAP,C 82PF-J-50V
C3054	ECA1CM471B	CAP,E 470UF-16V CT-27SX31E/CE/UE

REF NO.	PART NO.	DESCRIPTION
C4301	ECA0JM331B	CAP,E 330UF-6.3V CT-27SX31E/CE/UE
C4304	ECEA1CKA100B	CAP,E 10UF-16V CT-27SX31E/CE/UE
C4307	ECEA1CKN100B	CAP,E 10UF-16V CT-27SX31E/CE/UE
C4313	TCJ2VB1H561K	CAP,C 560PF-K-50V CT-27SX31E/CE/UE
C4314	ECA1HMR47B	CAP,E .47UF-50V CT-27SX31E/CE/UE
C4315	TCJ2VB1H152K	CAP,C 1500PF-K-50V CT-27SX31E/CE/UE
C4316	ECA0JM331B	CAP,E 330UF-6.3V CT-27SX31E/CE/UE
C4317	TCJ2VF1H103Z	CAP,C .01UF-Z-50V CT-27SX31E/CE/UE
C4319	TCJ2VC1H391J	CAP,C 390PF-J-50V CT-27SX31E/CE/UE
C4320	TCJ2VB1H681K	CAP,C 680PF-K-50V CT-27SX31E/CE/UE
C4801	ECA1HM4R7B	CAP,E 4.7UF-50V
C4803	ECQV1H334JL3	CAP,P .33UF-J-50V
C4804	ECQV1H334JL3	CAP,P .33UF-J-50V
C4805	ECA1VM470B	CAP,E 47UF/35V
C4806	ECA1HM4R7B	CAP,E 4.7UF-50V
C4808	ECA1HM330B	CAP,E 33UF-50V
C6501	ECA0JM101B	CAP,E 100UF-6.3V
C6502	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6503	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C6504	ECA1AM470B	CAP,E 47UF-10V
C6505	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6506	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6507	ECA1HMR47B	CAP,E .47UF-50V
C6508	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6509	ECA1CM470B	CAP,E 47UF/16V
C6510	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C6511	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C6512	ECA1CM470B	CAP,E 47UF/16V
C6513	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6514	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6515	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C6516	ECA1CM470B	CAP,E 47UF/16V
C6517	TCJ2VC1H181J	CAP,C 180PF-J-50V
C6518	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6519	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6520	ECA1CM470B	CAP,E 47UF/16V
C6525	TCJ2VC1H120J	CAP,C 12PF-J-50V
C6526	TCJ2VC1H270J	CAP,C 27PF-J-50V
C6532	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C6569	TCJ2VC1H180J	CAP,C 18PF-J-50V
C6570	ECA1HM010B	CAP,E 1UF-50V
C6572	ECEA1CN470UB	CAP,E 47UF-16V

DIODES

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

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REF NO.	PART NO.	DESCRIPTION
D001	MA165TA5VT	DIODE, SWITCHING
D002	MA165TA5VT	DIODE, SWITCHING
D003	MA4056MTA	DIODE
D006	MA4330HTA	DIODE
D010	MA4100LTA	DIODE
D014	MA165TA5VT	DIODE, SWITCHING
D015	MA700ATA	DIODE
D051	MA4062MTA	DIODE
D052	MA165TA5VT	DIODE, SWITCHING
D240	MA165TA5VT	DIODE, SWITCHING
D354	MA165TA5VT	DIODE, SWITCHING
D355	MA165TA5VT	DIODE, SWITCHING
D356	MA165TA5VT	DIODE, SWITCHING
D360	ERA22-04V3	DIODE, SILICONE
D361	ERA22-04V3	DIODE, SILICONE
D362	ERA22-04V3	DIODE, SILICONE
D363	MA165TA5VT	DIODE, SWITCHING
D375	MA165TA5VT	DIODE, SWITCHING
D451	ERA15-02V3	DIODE
D455	MA165TA5VT	DIODE, SWITCHING
D456	MA165TA5VT	DIODE, SWITCHING
D457	MA165TA5VT	DIODE, SWITCHING
D459	MA165TA5VT	DIODE, SWITCHING
D551	ERD07-15E	DIODE
D552	RU3NLF A1	DIODE
D553	MA4062LTVTA	DIODE, ZENER
D554	MA4270MTA	DIODE
D556	MA4360HTA	DIODE, ZENER
D561	MA165TA5VT	DIODE, SWITCHING
D562	D1NL40V70	DIODE
D563	TVSRU2NV1	DIODE, SILICONE
D564	TVSRU2NV1	DIODE, SILICONE
D570	D1NL40V70	DIODE
D575	MA165TA5VT	DIODE, SWITCHING
D580	D1NL40V70	DIODE
D753	AU01ZV0	DIODE
D754	MA165TA5VT	DIODE, SWITCHING
D801	GP15KL-042	DIODE
D802	GP15KL-042	DIODE
D803	GP15KL-042	DIODE
D804	GP15KL-042	DIODE
D806	TAP120M012	THERMISTOR
D807	D1NL20UV70	DIODE
D808	D1NL20UV70	DIODE
D809	MA4036MTA	DIODE
D810	MA4150MTA	DIODE
D811	MA4270MTA	DIODE
D812	D1NL20UV70	DIODE
D813	TMPG10G3	DIODE
D814	TMPG10G3	DIODE

REF NO.	PART NO.	DESCRIPTION
D822	RU3YX-MV1	DIODE, RECTIFIER
D823	S3L60P154004	DIODE
D824	D1NL20UV70	DIODE
D825	MA165TA5VT	DIODE, SWITCHING
D826	MA4180HTA	DIODE
D837	MA4068MTA	DIODE
D838	MA4150MTA	DIODE
D839	MA165TA5VT	DIODE, SWITCHING
D840	D1NL20UV70	DIODE
D845	MA165TA5VT	DIODE, SWITCHING
D2101	MA3330MTX	DIODE <i>CT-27SX31E/CE/UE</i>
D2302	MA165TA5VT	DIODE, SWITCHING
D2303	MA165TA5VT	DIODE, SWITCHING
D3014	03A505017	DIODE
D2318	MA165TA5VT	DIODE, SWITCHING
D3007	MA4110MTA	DIODE, ZENER
D3008	MA4110MTA	DIODE, ZENER
D3023	MA4110MTA	DIODE, ZENER
D3024	MA4110MTA	DIODE, ZENER
D3025	MA4110MTA	DIODE, ZENER
D3026	MA4110MTA	DIODE, ZENER
D3027	MA4110MTA	DIODE, ZENER
D3028	MA4110MTA	DIODE, ZENER
D3029	MA4110MTA	DIODE, ZENER
D3030	MA4110MTA	DIODE, ZENER
D3051	MA4110MTA	DIODE, ZENER <i>CT-27SX31E/CE/UE</i>
D4301	MA3036HTX	DIODE <i>CT-27SX31E/CE/UE</i>
FUSES		
F801	XBA2A00101	FUSE 6.3A 125V
INTEGRATED CIRCUITS		
IC001	MN101C46FTF1	MPU
IC002	TVR2AJ100	EEPROM
IC003	PIC-37042SR	REMOTE SENSOR
IC005	PQ1R33	STANDBY REG.
IC006	PST9128NR	RESET
IC101	TA1310BN	VCJ
IC351	TDA6103Q-N3	RGB OUT AMP.
IC451	LA78045	VERTICAL OUT
IC551	AN78M09LB	9V REG.
IC552	AN7805LB	5V REG.
IC750	NJM4565L	HORIZONTAL
IC801	PC123FY2	OPHTO COUPLER
IC802	PC123FY2	OPHTO COUPLER
IC820	UPC1093J-T	ZENER REG.
IC1801	M65617SP	PIP <i>CT-27SX31E/CE/UE</i>
IC2101	AN5170K	2ND. RF DECODER <i>CT-27SX31E/CE/UE</i>
IC2201	AN5849S-E1V	MTS
IC2301	AN5277	AUDIO OUT AMP.

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

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REF NO.	PART NO.	DESCRIPTION
IC2331	NJM4565L	VAO AMP.
IC2451	BH3868CFS-E2	SOUND PROCESSOR
IC3001	M52790SP	A/V SWITCH
IC3002	MM1502XNRE	PIP SW <i>CT-27SX31E/CE/UE</i>
IC4801	PUB4301	AMP.
IC4802	AN6564	AMP.
IC6501	TC90A49P	3L COMB FILTER
COILS		
J27	EXCELD25C	FERRITE BEAD
J146	EXCELSA35T	FERRITE BEAD
J157	EXCELSA39V	FERRITE BEAD
J159	TLTABT470K	COIL, PEAKING 47UH
L002	ELESN180JA	COIL, PEAKING 18UH
L003	TLTABT2R2K	COIL, PEAKING 2.2UH
L004	TLTABT2R2K	COIL, PEAKING 2.2UH
L005	ELESN330JA	COIL, PEAKING 33UH
L006	EXCELSA35V	FERRITE BEAD
L010	TLTABT2R2K	COIL, PEAKING 2.2UH
L011	TLTABT2R2K	COIL, PEAKING 2.2UH
L012	TLTABT2R2K	COIL, PEAKING 2.2UH
L013	TLTABT2R2K	COIL, PEAKING 2.2UH
L100	TLTABT2R2K	COIL, PEAKING 2.2UH
L157	TLTABT101K	COIL
L301	TLTABT470K	COIL, PEAKING 47UH
L302	ELESN120JA	COIL, PEAKING 12UH
L319	TLTABT101K	COIL, PEAKING
L519	ELESN101JA	COIL, PEAKING 100UH
L551	ELH5L6120	COIL
L553	EXCELSA39V	FERRITE BEAD
L556	ELC18B801E	COIL
L559	TLUADNB682K	COIL
L601	TLUABTA560K	COIL, PEAKING 56UH
L706	EXCELSA35T	FERRITE BEAD
L751	ELC18B801E	COIL
L752	TALL13N103JB	COIL
L801	ELF20N020A	COIL, 2UH
L802	G0C681Z00001	COIL
L803	EXCELSA26T	FERRITE BEAD
L805	TALL08T220KA	TRANSFORMER, LINE FILTER
L807	EXCELSA39V	FERRITE BEAD
L808	ELF20N020A	COIL, 2UH
L809	EXCELSA39V	FERRITE BEAD
L951	EXCELSA24T	FERRITE BEAD
L953	EXCELSA24T	FERRITE BEAD
L954	EXCELSA24T	FERRITE BEAD
L955	EXCELSA24T	FERRITE BEAD
L1801	ELESN1R5KA	COIL, PEAKING 1.5UH <i>CT-27SX31E/CE/UE</i>
L1803	ELESN2R2KA	COIL, PEAKING 2.2UH <i>CT-27SX31E/CE/UE</i>

REF NO.	PART NO.	DESCRIPTION
L1804	ELESN150JA	COIL, PEAKING 15UH <i>CT-27SX31E/CE/UE</i>
L1806	ELESN1R0KA	COIL, PEAKING 1.0UH <i>CT-27SX31E/CE/UE</i>
L1807	ELESN1R0KA	COIL, PEAKING 1.0UH <i>CT-27SX31E/CE/UE</i>
L1808	EXCELD25V	FERRITE BEAD <i>CT-27SX31E/CE/UE</i>
L2103	ELESN150KA	COIL, PEAKING 15UH <i>CT-27SX31E/CE/UE</i>
L2106	ELESN560KA	COIL, PEAKING 56UH <i>CT-27SX31E/CE/UE</i>
L2109	EIV7EN053B	COIL, VCO <i>CT-27SX31E/CE/UE</i>
L4301	ELESN3R9KA	COIL, PEAKING 3.9UH <i>CT-27SX31E/CE/UE</i>
L6503	ELESN330JA	COIL, PEAKING 33UH
L6504	EXCELSA35V	FERRITE BEAD
L6505	EXCELSA35V	FERRITE BEAD
L6507	ELESN150JA	COIL, PEAKING 15UH
L6509	EXCELSA35V	FERRITE BEAD
TRANSISTORS		
Q001	2SC1685QRSTA	TRANSISTOR
Q002	2SC1685QRSTA	TRANSISTOR
Q003	2SD601ARTX	TRANSISTOR
Q004	2SC1685QRSTA	TRANSISTOR
Q005	2SD601ARTX	TRANSISTOR
Q006	2SD601ARTX	TRANSISTOR
Q007	2SC1685QRSTA	TRANSISTOR
Q014	2SD601ARTX	TRANSISTOR <i>CT-27SX31E/CE/UE</i>
Q201	2SD601ARTX	TRANSISTOR
Q302	2SB709ARTX	TRANSISTOR <i>CT-27SX31E/CE/UE</i>
Q303	2SD601ARTX	TRANSISTOR
Q369	2SA1309ATA	TRANSISTOR
Q402	2SD601ARTX	TRANSISTOR
Q453	2SD601ARTX	TRANSISTOR
Q480	2SA1309ATA	TRANSISTOR
Q501	2SC3941HTA	TRANSISTOR
Q515	2SD601ARTX	TRANSISTOR
Q551	2SC5339LBMA1	TRANSISTOR
Q603	2SD601ARTX	TRANSISTOR
Q611	2SB709ARTX	TRANSISTOR
Q701	2SD601ARTX	TRANSISTOR
Q751	2SK2146LB	TRANSISTOR
Q754	2SD601ARTX	TRANSISTOR
Q801	B1DEGQ000013	TRANSISTOR
Q803	2SC1318STA	TRANSISTOR
Q804	2SC1318STA	TRANSISTOR
Q805	2SC1318STA	TRANSISTOR
Q821	2SC3311ASTA	TRANSISTOR
Q822	2SC3311ASTA	TRANSISTOR

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

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REF NO.	PART NO.	DESCRIPTION
Q861	2SB1011QRL	TRANSISTOR
Q862	2SC1473ATA	TRANSISTOR
Q901	2SD601ARTX	TRANSISTOR
Q951	2SC3311ATA	TRANSISTOR
Q952	2SC3311ATA	TRANSISTOR
Q953	2SC1741ASTP	TRANSISTOR
Q954	2SB1030ATA	TRANSISTOR
Q955	2SB1569AF51E	TRANSISTOR
Q956	2SD2400AF51E	TRANSISTOR
Q957	2SA1309ATA	TRANSISTOR
Q958	2SC3311ATA	TRANSISTOR
Q961	2SC3311ATA	TRANSISTOR
Q962	2SC3311ATA	TRANSISTOR
Q1801	2SD601ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q1802	2SD601ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q1803	2SD601ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q1804	2SB709ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q1805	2SB709ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q2101	2SD601ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q2301	2SD601ARTX	TRANSISTOR
Q2302	2SD601ARTX	TRANSISTOR
Q2303	2SD601ARTX	TRANSISTOR
Q2331	2SD601ARTX	TRANSISTOR
Q2332	2SB709ARTX	TRANSISTOR
Q2333	2SD601ARTX	TRANSISTOR
Q2334	2SD601ARTX	TRANSISTOR
Q2335	2SB709ARTX	TRANSISTOR
Q2336	2SD601ARTX	TRANSISTOR
Q3050	2SD601ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q4309	2SB709ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q4310	2SD601ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q4311	2SB709ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q4312	2SD601ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q4313	2SD601ARTX	TRANSISTOR CT-27SX31E/CE/UE
Q4315	2SC1384QR	TRANSISTOR CT-27SX31E/CE/UE
Q6501	2SD601ARTX	TRANSISTOR
Q6502	2SB709ARTX	TRANSISTOR
Q6506	2SC601ARTX	TRANSISTOR
Q6510	2SD601ARTX	TRANSISTOR
Q6511	2SD601ARTX	TRANSISTOR

REF NO.	PART NO.	DESCRIPTION
Q6512	2SD601ARTX	TRANSISTOR
Q6519	2SD601ARTX	TRANSISTOR
RELAYS		
RL801	TSEH0005	RELAY
RL802	TSEH0005	RELAY
RESISTORS		
R001	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R002	ERJ6GEYJ182V	RES,M 1.8K-J-1/10W
R004	ERDS1TJ122T	RES,C 1.2K-J-1/2W
R005	ERDS2TJ470T	RES,C 47-J-1/4W
R006	ERJ6ENF1372V	RES,M 13.7K-F-1/10W
R007	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R009	ERJ6GEYJ221V	RES,M 220-J-1/10W
R010	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R011	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R012	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R013	ERJ6ENF1002V	RES,M 10K-F-1/10W
R014	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W
R015	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R016	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R017	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R020	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W
R021	ERJ6GEYJ101V	RES,M 100-J-1/10W
R022	ERJ6GEYJ101V	RES,M 100-J-1/10W
R023	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R024	ERJ6ENF2322V	RES,M 23.2K-F-1/10W
R025	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R026	ERJ6GEYJ223V	RES,M 22K-J-1/10W CT-27SX31E/CE/UE
R026	ERJ6GEYJ473V	RES,M 47K-J-1/10W CT-27SX31E/CE/UE
R027	ERJ6GEYJ103V	RES,M 10K-J-1/10W CT-27SX31E/CE/UE
R027	ERJ6GEYJ183V	RES,M 18K-J-1/10W CT-27SX31E/CE/UE
R028	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W CT-27SX31E/CE/UE
R029	ERJ6GEYJ103V	RES,M 10K-J-1/10W CT-27SX31E/CE/UE
R030	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R032	ERJ6ENF1002V	RES,M 10K-F-1/10W
R033	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W
R034	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R035	ERJ6GEYJ362V	RES,M 3.6K-J-1/10W
R036	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R037	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R038	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R039	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R040	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R041	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R042	ERJ6GEYJ102V	RES,M 1K-J-1/10W

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R043	ERJ6GEYJ223V	RES,M 22K-J-1/10W CT-27SX31E/CE/UE
R044	ERJ6GEYJ273V	RES,M 27K-J-1/10W
R045	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R046	ERJ6GEYJ333V	RES,M 33K-J-1/10W
R047	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R048	ERJ6GEYJ333V	RES,M 33K-J-1/10W
R049	ERJ6GEYJ101V	RES,M 100-J-1/10W
R050	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R051	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R052	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R053	ERJ6GEYJ123V	RES,M 12K-J-1/10W
R054	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R057	ERDS2TJ472T	RES,C 4.7K-J-1/4
R059	ERJ6GEYJ223V	RES,M 22K-J-1/10W CT-27SX31E/CE/UE
R060	ERJ6GEYJ471V	RES,M 470-J-1/10W
R061	ERJ6GEYJ471V	RES,M 470-J-1/10W
R062	ERDS2TJ101T	RES,C 100-J-1/4W
R066	ERJ6GEYJ752V	RES,M 7.5K-J-1/10W
R067	ERJ6GEYJ752V	RES,M 7.5K-J-1/10W
R068	ERJ6GEYJ752V	RES,M 7.5K-J-1/10W
R072	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R073	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R074	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R075	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R076	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R077	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R078	ERJ6GEYJ101V	RES,M 100-J-1/10W
R079	ERJ6GEYJ101V	RES,M 100-J-1/10W
R081	ERJ6GEYJ220V	RES,M 22-J-1/10W CT-27SX31E/CE/UE
R122	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R123	ERJ5GEYJ562V	RES,M 5600-J-1/10W
R201	ERJ6GEYJ331V	RES,M 330-J-1/10W
R223	ERJ6GEYJ561V	RES,M 560-J-1/10W
R225	ERJ6GEYJ331V	RES,M 330-J-1/10W
R226	ERJ6GEYJ331V	RES,M 330-J-1/10W
R245	ERJ6GEYJ224V	RES,M 220K-J-1/10W
R246	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R301	ERJ6GEYJ101V	RES,M 100-J-1/10W
R302	ERJ6GEYJ101V	RES,M 100-J-1/10W
R303	ERJ6GEYJ101V	RES,M 100-J-1/10W
R305	ERJ6GEYJ103V	RES,M 10K-J-1/10W CT-27SX31E/CE/UE
R306	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R309	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W CT-27SX31E/CE/UE
R310	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W
R328	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R329	ERJ6GEYJ304V	RES,M 300K-J-1/10W
R341	ERJ6GEYJ474V	RES,M 470K-J-1/10W

REF NO.	PART NO.	DESCRIPTION
R351	ER0S2TKF9100	RES,M 910-F-1/4W
R352	ER0S2TKF9100	RES,M 910-F-1/4W
R353	ER0S2TKF9100	RES,M 910-F-1/4W
R354	ERDS2TJ621T	RES,C 620-J-1/4W
R355	ERDS2TJ621T	RES,C 620-J-1/4W
R356	ERDS2TJ621T	RES,C 620-J-1/4W
R357	ERDS2TJ102T	RES,C 1K-J-1/4W
R358	ERDS1TJ134T	RES,C 130K-J-1/2W
R359	ERDS1TJ134T	RES,C 130K-J-1/2W
R360	ERDS1TJ134T	RES,C 130K-J-1/2W
R361	ER0S2TKF8451	RES,M 8.45K-F-1/4W
R362	ER0S2TKF2001	RES,M 2K-F-1/4W
R363	ERC12GK102D	RES,C 1K-K-1/2W
R364	ERC12GK102D	RES,C 1K-K-1/2W
R365	ERC12GK102D	RES,C 1K-K-1/2W
R369	ERDS2TJ393T	RES,C 39K-J-1/4W
R371	ERDS2TJ102T	RES,C 1K-J-1/4W
R372	ERDS2TJ102T	RES,C 1K-J-1/4W
R374	ERQ12AJ121P	RES,F 120-J-1/2W
R375	ERDS2TJ222T	RES,C 2.2K-J-1/4W
R401	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R402	ERJ6GEYJ471V	RES,M 470-J-1/10W
R403	ERJ6GEYJ622V	RES,M 6.2K-J-1/10W
R404	ERJ6GEYJ101V	RES,M 100-J-1/10W
R405	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R410	ERJ6ENF2492V	RES,M 24.9K-F-1/10W
R412	ERJ6ENF6202V	RES,M 62K-F-1/10W
R450	ERJ6GEYJ821V	RES,M 820-J-1/10W
R451	ERG2FJ221H	RES,M 220-J-2W
R452	ERDS1FJ6R8T	RES,C 6.8-J-1/2W
R453	ER0S2TKF1202	RES,M 12K-F-1/4W
R454	ERDS2TJ182T	RES,C 1.8K-J-1/4W
R455	ERDS2TJ512T	RES,C 5.1K-J-1/4W
R456	ERDS2TJ182T	RES,C 1.8K-J-1/4W
R457	ERDS2TJ112T	RES,C 1.1K-J-1/4W
R458	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R459	ERX1SJ1R2P	RES,M 1.2-J-1W
R460	ER0S2TKF1002	RES,M 10K-F-1/4
R461	ER0S2TKF1501	RES,M 1.5K-F-1/4W
R465	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R468	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R469	ERJ6GEYJ101V	RES,M 100-J-1/10W
R470	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R471	ERJ6GEYJ224V	RES,M 220K-J-1/10W
R472	ERJ6GEYJ123V	RES,M 12K-J-1/10W
R476	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W
R480	ERDS2TJ392T	RES,C 3.9K-J-1/4W
R481	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R482	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R485	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

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REF NO.	PART NO.	DESCRIPTION
R486	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R487	ERJ6GEYJ822V	RES,M 8.2K-J-1/10W
R489	ER0S2TKF1202	RES,M 12K-F-1/4W
R490	ER0S2TKF5101	RES,M 5.1K-F-1/4W
R491	ER0S2TKF1052	RES,M 10.5K-F-1/4W
R504	ERJ6GEYJ333V	RES,M 33K-J-1/10W
R505	ERDS1TJ561T	RES,C 560-J-1/2W
R510	ERG2FJ332H	RES,M 3.30K-J-2W
R512	ERG3FJ152H	RES,M 1500-J-3W
R513	ERG3FJ152H	RES,M 1500-J-3W
R515	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R516	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R517	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R524	ERG1FJS122D	RES,M 1200-J-1W
R542	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W
R547	ERQ1CJPR82S	RES,F .82-J-1W
R550	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W
R553	ERG3FJ680H	RES,M 68-J-3W
R554	ERG3FJ680H	RES,M 68-J-3W
R556	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R557	ERF10ZK2R7	RES,W 2.7-K-10W
R559	ERG2FJ683H	RES,M 12K-J-2W
R560	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R561	ERDS2TJ103T	RES,C 10K-J-1/4W
R562	ERDS2TJ272T	RES,C 2.7K-J-1/4W
R565	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R567	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R569	ERG2FJ683H	RES,M 12K-J-2W CT-27SX31E/CE/UE
R571	ERDS1FJ1R0T	RES,C 1.0-J-1/2W
R576	ERQ12AJ101P	RES,F 100-J-1/2W
R580	ERD25FJ4R7P	RES,C 4.7-J-1/4W
R581	ERJ6ENF1692V	RES,M 16.9K-F-1/10W
R582	ERJ6ENF4992V	RES,M 49.9K-F-1/10W
R590	ERDS2TJ473T	RES,C 47K-J-1/4W
R597	ER0S2TKF2202	RES,M 22K-F-1/4W
R601	ERJ6GEYJ391V	RES,M 390-J-1/10W
R606	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R613	ERJ6GEYJ471V	RES,M 470-J-1/10W
R614	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R618	ERJ6GEYJ474V	RES,M 470K-J-1/10W
R619	ERJ6GEYJ563V	RES,M 56K-J-1/10W
R620	ERJ6GEYJ333V	RES,M 33K-J-1/10W
R701	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R702	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R704	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R705	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W
R706	ERJ6GEYJ161V	RES,M 160-J-1/10W
R707	ERJ6GEYJ561V	RES,M 560-J-1/10W
R708	ERJ6GEYJ101V	RES,M 100-J-1/10W
R709	ERJ6GEYJ103V	RES,M 10K-J-1/10W

REF NO.	PART NO.	DESCRIPTION
R710	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R711	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R712	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R713	ERJ6GEYJ822V	RES,M 8.2K-J-1/10W
R714	ERDS1FJ102T	RES,C 1K-J-1/2W
R716	ERJ6GEYJ101V	RES,M 100-J-1/10W
R717	ERJ6GEYJ101V	RES,M 100-J-1/10W
R719	ERJ6GEYJ225V	RES,M 2.2M-J-1/10W
R720	ERJ6GEYJ274V	RES,M 270K-J-1/10W
R752	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R753	ERDS1FJ102T	RES,C 1K-J-1/2W
R754	ERDS1TJ751T	RES,C 750-J-1/2W
R756	ERG2FJ820H	RES,M 82-J-2W
R757	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R801	ERF7ZK1R5	RES,W 1.5-K-7W
R804	ERDS2TJ182T	RES,C 1.8K-J-1/4W
R805	ERG2FJ331H	RES,M 330-J-2W
R806	ERDS2TJ473T	RES,C 47K-J-1/4W
R807	ERD50FJ474P	RES,C 470K-J-1/2W
R808	ERD50FJ474P	RES,C 470K-J-1/2W
R809	ERDS2TJ561T	RES,C 560-J-1/4W
R811	ER0S2TKF2611	RES
R812	ERDS2TJ331T	RES,C 330-J-1/4W
R813	ERDS2TJ223T	RES,C 22K-J-1/4W
R814		
R815	ERC12ZGM825D	RES,S 8.2MEG-M-1/2
R820	ERJ6GEYJ273V	RES,M 27K-J-1/10W
R821	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W
R822	ERDS1FJ102T	RES,C 1K-J-1/2W
R823	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R826	ERDS2TJ104T	RES,C 100K-J-1/4W
R827	ERDS2TJ183T	RES,C 18K-J-1/4W
R828	ERDS2TJ104T	RES,C 100K-J-1/4W
R829	ERX12SJR47P	RES,M .47-J-1/2W
R830	ERDS2TJ103T	RES,C 10K-J-1/4
R832	ERDS2TJ104T	RES,C 100K-J-1/4W
R833	ERDS2TJ474T	RES,C 470K-J-1/4W
R836	ERDS2TJ222T	RES,C 2.2K-J-1/4W
R837	ERDS2TJ102T	RES,C 1K-J-1/4W
R838	ER0S2TKF2201	RES,M 2.2K-F-1/4W
R839	ER0S2TKF1003	RES,M 100K-F-1/4
R843	ERDS2TJ271T	RES,C 270-J-1/4W
R844	ERDS2TJ222T	RES,C 2.2K-J-1/4W
R845	ERDS2TJ334T	RES,C 330K-J-1/4W
R849	ER0S2TKF2002	RES,M 20K-F-1/4W
R850	ERQ12HJR56P	RES,F .56-J-1/2W
R851	ERX12SJR47P	RES,M .47-J-1/2W
R853	ERX12SZJR12P	RES,M .12-J-1/2W
R854	ERX12SJR22P	RES,M .22-J-1/2W
R855	ERDS2TJ473T	RES,C 47K-J-1/4W

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

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REF NO.	PART NO.	DESCRIPTION
R856	ERQ3CJ3R9	RES,F 3.9-J-3W
R857	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R858	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W
R861	ERDS2TJ103T	RES,C 10K-J-1/4
R862	ERDS2TJ104T	RES,C 100K-J-1/4W
R863	ERJ6GEYJ393V	RES,M 39K-J-1/10W
R864	ERDS2TJ104T	RES,C 100K-J-1/4W
R901	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R902	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R903	ERJ6GEYJ561V	RES,M 560-J-1/10W
R904	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W
R905	ERJ6GEYJ391V	RES,M 390-J-1/10W
R951	ERDS2TJ821T	RES,C 820-J-1/4W
R952	ERDS2TJ153T	RES,C 15K-J-1/4W
R953	ERDS2TJ332T	RES,C 3.3K-J-1/4W
R954	ERDS2TJ431T	RES,C 430-J-1/4W
R956	ERDS2TJ121T	RES,C 120-J-1/4W
R958	ERDS2TJ391T	RES,C 390-J-1/4W
R959	ERDS2TJ101T	RES,C 100-J-1/4W
R960	ERQ14AJ100E	RES,F 10-J-1/4W
R961	ERQ1CJP331S	RES,F 330-J-1W
R962	ERDS2TJ330T	RES,C 33-J-1/4W
R963	ERDS2TJ330T	RES,C 33-J-1/4W
R964	ERDS2TJ471T	RES,C 470-J-1/4W
R965	ERDS2TJ563T	RES,C 56K-J-1/4W
R966	ERDS1FVJ471T	RES,C 470-J-1/4W
R967	ERDS2TJ563T	RES,C 56K-J-1/4W
R968	ERDS2TJ471T	RES,C 470-J-1/4W
R969	ERDS2TJ390T	RES,C 39-J-1/2W
R970	ERDS2TJ2R2T	RES,C 2.2-J-1/4W
R971	ERDS2TJ2R2T	RES,C 2.2-J-1/4W
R972	ERDS2TJ390T	RES,C 39-J-1/2W
R973	ERDS2TJ101T	RES,C 100-J-1/4W
R974	ERDS2TJ333T	RES,C 33K-J-1/4W
R975	ERDS2TJ101T	RES,C 100-J-1/4W
R976	ERDS2TJ101T	RES,C 100-J-1/4W
R977	ERDS2TJ561T	RES,C 560-J-1/4W
R978	ERDS2TJ101T	RES,C 100-J-1/4W
R987	ERDS2TJ472T	RES,C 4.7K-J-1/4
R988	ERDS2TJ331T	RES,C 330-J-1/4W
R989	ERDS2TJ682T	RES,C 6.8K-J-1/4W
R990	ERDS2TJ471T	RES,C 470-J-1/4W
R993	ERDS2TJ471T	RES,C 470-J-1/4W
R1801	ERJ6GEYJ301V	RES,M 300-J-1/10W CT-27SX31E/CE/UE
R1802	ERJ6GEYJ104V	RES,M 100K-J-1/10W CT-27SX31E/CE/UE
R1803	ERJ6GEYJ474V	RES,M 470K-J-1/10W CT-27SX31E/CE/UE
R1804	ERJ6GEYJ202V	RES,M 2K-J-1/10W CT-27SX31E/CE/UE

REF NO.	PART NO.	DESCRIPTION
R1805	ERJ6GEYJ102V	RES,M 1K-J-1/10W CT-27SX31E/CE/UE
R1807	ERJ6GEYJ103V	RES,M 10K-J-1/10W CT-27SX31E/CE/UE
R1808	ERJ6GEYJ103V	RES,M 10K-J-1/10W CT-27SX31E/CE/UE
R1809	ERJ6GEYJ473V	RES,M 47K-J-1/10W CT-27SX31E/CE/UE
R1810	ERJ6GEYJ103V	RES,M 10K-J-1/10W CT-27SX31E/CE/UE
R1811	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W CT-27SX31E/CE/UE
R1812	ERJ6GEYJ153V	RES,M 15K-J-1/10W CT-27SX31E/CE/UE
R1813	ERJ6GEYJ153V	RES,M 15K-J-1/10W CT-27SX31E/CE/UE
R1814	ERJ6GEYJ271V	RES,M 270-J-1/10W CT-27SX31E/CE/UE
R1815	ERJ6GEYJ361V	RES,M 360-J-1/10W CT-27SX31E/CE/UE
R1818	ERJ6GEYJ101V	RES,M 100-J-1/10W CT-27SX31E/CE/UE
R1819	ERJ6GEYJ101V	RES,M 100-J-1/10W CT-27SX31E/CE/UE
R1822	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W CT-27SX31E/CE/UE
R1823	ERJ6GEYJ473V	RES,M 47K-J-1/10W CT-27SX31E/CE/UE
R1825	ERJ6GEYJ471V	RES,M 470-J-1/10W CT-27SX31E/CE/UE
R1827	ERJ6GEYJ102V	RES,M 1K-J-1/10W CT-27SX31E/CE/UE
R1828	ERJ6GEYJ471V	RES,M 470-J-1/10W CT-27SX31E/CE/UE
R1830	ERJ6GEYJ102V	RES,M 1K-J-1/10W CT-27SX31E/CE/UE
R1856	ERJ6GEYJ153V	RES,M 15K-J-1/10W CT-27SX31E/CE/UE
R2106	ERJ6GEYJ183V	RES,M 18K-J-1/10W CT-27SX31E/CE/UE
R2109	ERJ6GEYJ683V	RES,M 68K-J-1/10W CT-27SX31E/CE/UE
R2110	ERJ6GEYJ331V	RES,M 330-J-1/10W CT-27SX31E/CE/UE
R2111	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W CT-27SX31E/CE/UE
R2112	ERJ6GEYJ331V	RES,M 330-J-1/10W CT-27SX31E/CE/UE
R2113	ERJ6GEYJ102V	RES,M 1K-J-1/10W CT-27SX31E/CE/UE
R2114	ERJ6GEYJ681V	RES,M 680-J-1/10W CT-27SX31E/CE/UE
R2116	ERJ6GEYJ102V	RES,M 1K-J-1/10W CT-27SX31E/CE/UE
R2117	ERJ6GEYJ121V	RES,M 120-J-1/10W CT-27SX31E/CE/UE

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R2118	EVND8AA03B14	CONTROL 10K CT-27SX31E/CE/UE
R2119	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W CT-27SX31E/CE/UE
R2121	ERJ6GEYJ221V	RES,M 220-J-1/10W CT-27SX31E/CE/UE
R2122	ERJ6GEYJ473V	RES,M 47K-J-1/10W CT-27SX31E/CE/UE
R2123	ERJ6GEYJ473V	RES,M 47K-J-1/10W CT-27SX31E/CE/UE
R2124	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W CT-27SX31E/CE/UE
R2127	ERJ6GEYJ101V	RES,M 100-J-1/10W CT-27SX31E/CE/UE
R2203	ERJ6GEYJ751V	RES,M 750-J-1/10W
R2206	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2207	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2221	ERJ6GEYJ273V	RES,M 27K-J-1/10W
R2303	ERJ6GEYJ822V	RES,M 8.2K-J-1/10W
R2304	ERJ6GEYJ822V	RES,M 8.2K-J-1/10W
R2307	ERJ6GEYJ822V	RES,M 8.2K-J-1/10W
R2309	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R2310	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R2311	ERJ6GEYJ271V	RES,M 270-J-1/10W
R2312	ERJ6GEYJ153V	RES,M 15K-J-1/10W
R2313	ERJ6GEYJ153V	RES,M 15K-J-1/10W
R2316	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2317	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2318	ERDS1TJ332T	RES,C 3.3K-J-1/2W
R2319	ERDS1TJ332T	RES,C 3.3K-J-1/2W
R2321	ERDS2TJ181T	RES,C 180-J-1/4W
R2322	ERDS2TJ181T	RES,C 180-J-1/4W
R2323	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R2324	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2325	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2326	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2332	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R2333	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2334	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2335	ERJ6GEYJ183V	RES,M 18K-J-1/10W
R2336	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W
R2337	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W
R2338	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W
R2339	ERJ6GEYJ183V	RES,M 18K-J-1/10W
R2340	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W
R2345	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2346	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R2347	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R2349	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R2351	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2352	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R2353	ERJ6GEYJ563V	RES,M 56K-J-1/10W

REF NO.	PART NO.	DESCRIPTION
R2354	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2356	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2366	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R2367	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R2431	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R2432	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R2433	ERJ6ENF4701V	RES,M 4.7K-F-1/10W
R2434	ERJ6GEYJ681V	RES,M 680-J-1/10W
R2435	ERJ6ENF3902V	RES,M 39K-F-1/10W
R2436	ERJ6ENF6202V	RES,M 62K-F-1/10W
R2437	ERJ6GEYJ681V	RES,M 680-J-1/10W
R2438	ERJ6GEYJ271V	RES,M 270-J-1/10W
R2439	ERJ6GEYJ271V	RES,M 270-J-1/10W
R3001	ERJ6GEYJ101V	RES,M 100-J-1/10W
R3003	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3004	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3005	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3006	ERJ6ENF75R0V	RES,M 75.0-F-1/10W
R3007	ERJ6ENF75R0V	RES,M 75.0-F-1/10W
R3008	ERJ6GEYJ750V	RES,M 75-J-1/10W
R3009	ERJ6ENF75R0V	RES,M 75.0-F-1/10W
R3010	ERJ6ENF75R0V	RES,M 75.0-F-1/10W
R3011	ERJ6ENF75R0V	RES,M 75.0-F-1/10W
R3012	ERJ6ENF75R0V	RES,M 75.0-F-1/10W
R3013	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3014	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3015	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3016	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3017	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3018	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3019	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R3020	ERJ6GEYJ330V	RES,M 33-J-1/10W
R3021	ERJ6GEYJ471V	RES,M 470-J-1/10W CT-27SX31E/CE/UE
R3022	ERJ6GEYJ471V	RES,M 470-J-1/10W CT-27SX31E/CE/UE
R3024	ERJ6ENF75R0V	RES,M 75.0-F-1/10W
R3025	ERJ6ENF75R0V	RES,M 75.0-F-1/10W
R3060	ERJ6GEYJ471V	RES,M 470-J-1/10W CT-27SX31E/CE/UE
R3061	ERJ6GEYJ471V	RES,M 470-J-1/10W CT-27SX31E/CE/UE
R3065	ERJ6GEYJ680V	RES,M 68-J-1/10W CT-27SX31E/CE/UE
R3069	ERJ6GEYJ471V	RES,M 470-J-1/10W CT-27SX31E/CE/UE
R4310	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W CT-27SX31E/CE/UE
R4311	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W CT-27SX31E/CE/UE
R4326	ERD25VJ221T	RES,C 220-J-1/4 CT-27SX31E/CE/UE

REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R4327	ERJ6GEYJ331V	RES,M 330-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4328	ERJ6GEYJ560V	RES,M 56-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4329	ERJ6GEYJ182V	RES,M 1.8K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4330	ERJ6GEYJ561V	RES,M 560-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4331	ERJ6GEYJ391V	RES,M 390-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4332	ERJ6GEYJ393V	RES,M 39K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4333	ERJ6GEYJ304V	RES,M 300K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4334	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4336	ERJ6GEYJ680V	RES,M 68-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4338	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4339	ERJ6GEYJ102V	RES,M 1K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4340	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4341	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4342	ERJ6GEYJ223V	RES,M 22K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4344	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4345	ERJ6GEYJ103V	RES,M 10K-J-1/10W <i>CT-27SX31E/CE/UE</i>
R4801	ERDS2TJ472T	RES,C 4.7K-J-1/4
R4803	ERX12SJ1R0P	RES,M 1.0-J-1/2W
R4804	ER0S2TKF2201	RES,M 2.2K-F-1/4W
R4805	ER0S2TKF2201	RES,M 2.2K-F-1/4W
R4806	ER0S2TKF2201	RES,M 2.2K-F-1/4W
R4807	ER0S2TKF2201	RES,M 2.2K-F-1/4W
R4808	ER0S2TKF3003	RES,M 300K-F-1/4W
R4809	ER0S2TKF1002	RES,M 10K-F-1/4
R4810	ER0S2TKF1502	RES,M 15.0K-F-1/4
R4811	ER0S2TKF1002	RES,M 10K-F-1/4
R4812	ER0S2TKF3301	RES,M 3.3K-F-1/4W
R4815	ERDS1FJ100T	RES,C 10-J-1/2W
R6501	ERJ6GEYJ273V	RES,M 27K-J-1/10W
R6502	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R6503	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R6504	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R6505	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R6506	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R6509	ERJ6GEYJ471V	RES,M 470-J-1/10W
R6510	ERJ6GEYJ471V	RES,M 470-J-1/10W
R6512	ERJ6GEYJ471V	RES,M 470-J-1/10W
R6513	ERJ6GEYJ122V	RES

REF NO.	PART NO.	DESCRIPTION
R6514	ERJ6GEYJ123V	RES,M 12K-J-1/10W
R6516	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R6517	ERJ6GEYJ471V	RES,M 470-J-1/10W
R6520	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R6522	ERJ6GEYJ471V	RES,M 470-J-1/10W
R6524	ERJ6GEYJ471V	RES,M 470-J-1/10W
R6538	ERJ6GEYJ821V	RES,M 820-J-1/10W
R6548	ERJ6GEYJ471V	RES,M 470-J-1/10W
R6565	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R6566	ERJ6GEYJ681V	RES,M 680-J-1/10W
R6567	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R6568	ERJ6GEYJ102V	RES,M 1K-J-1/10W
SWITCHES		
S001	EVQPC105K	SWITCH
S002	EVQPC105K	SWITCH
S003	EVQPC105K	SWITCH
S004	EVQPC105K	SWITCH
S005	EVQPC105K	SWITCH
S006	EVQPC105K	SWITCH
S007	EVQPC105K	SWITCH
TRANSFORMERS		
T501	ETH19Y70AY	TRANSFORMER, HORIZONTAL DRIVER
T551	KFT4AA390F	TRANSFORMER, FLYBACK
T801	ETS39AG375NC	TRANSFORMER
CRISTALS/FILTERS		
X001	TSSA092	CRYSTAL OSCILLATOR
X501	TSS2AA001	CRYSTAL, 3.58MHZ
X601	TAFC5B503F30	CRYSTAL
X1801	TSSA092	CRYSTAL OSCILLATOR <i>CT-27SX31E/CE/UE</i>
X2102	EFCS4R5MW5BA	FILTER, BANDPASS <i>CT-27SX31E/CE/UE</i>
X2103	M1972M	FILTER <i>CT-27SX31E/CE/UE</i>
OTHERS		
TNR001	ENG36604G	TUNER <i>CT-27SX11E/CE/UE</i>
TNR001	ENG36613G	TUNNER <i>CT-27SX31E/CE/UE</i>
TNR002	ENV56D61G3	TUNNER <i>CT-27SX31E/CE/UE</i>
M001	TSX2AA0111-1	A/C LINE CORD
M002	A68QCP893XU	CRT 27
M003	TJSC01200	CRT SOCKET
DY	TLY2AA016	DEFLECTION YOKE
M004	TXF3A01ZERA	ASSY., DAG GND
DEG	TSP2AA019	COIL, DEGAUSSING
M005	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP
M006	TSP2AF002	COIL, ROTATION
M007	ENPE630	SPLITTER, RF <i>CT-27SX31E/CE/UE</i>
M008	TAS2AA0023	SPEAKER 8-OHM
M009	TBM2A30843	BADGE, PANASONIC
M010	TBX2AA0151G	BUTTON, 7-KEY

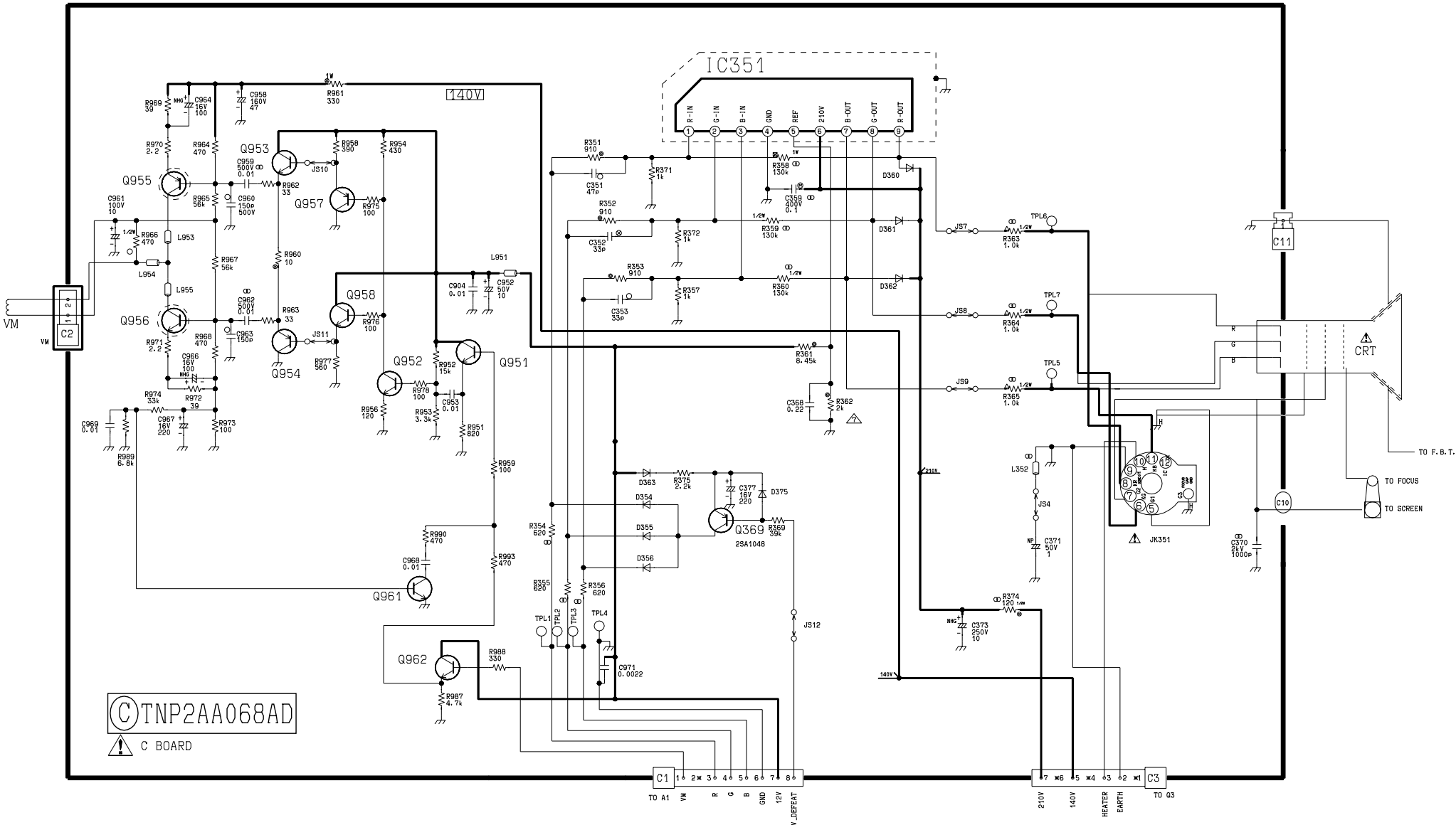
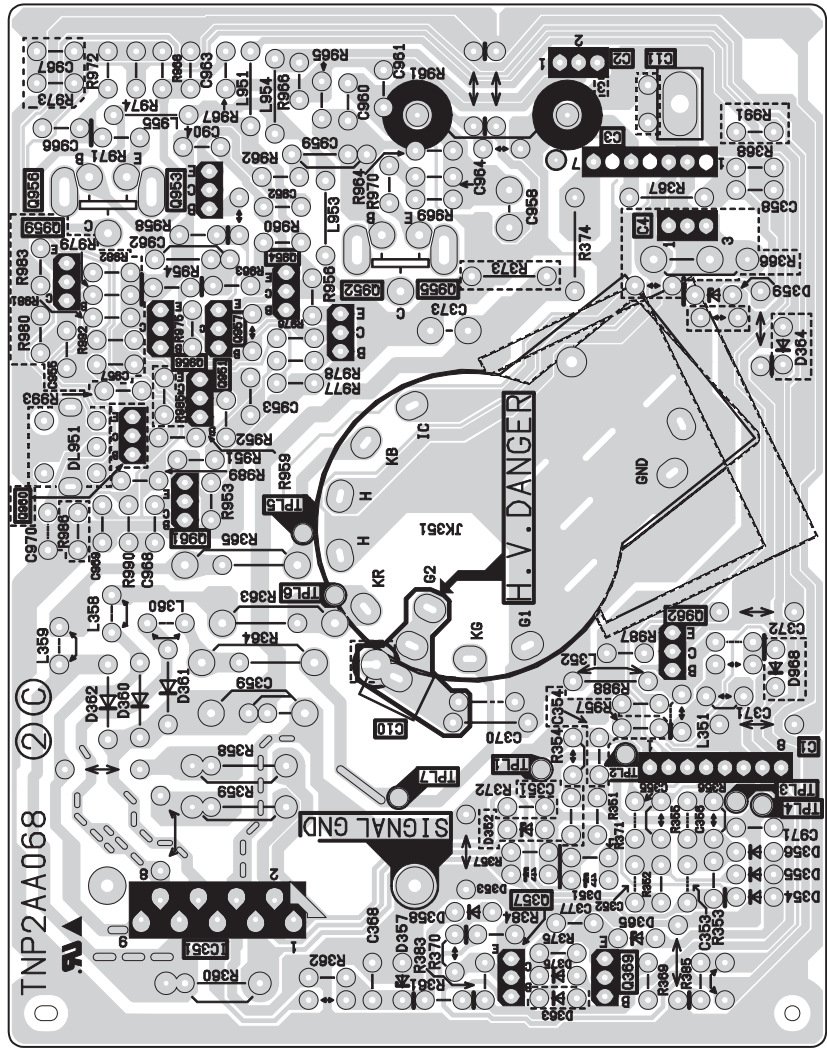
REPLACEMENT PARTS LIST

Model:CT-27SX31E/UE/CE & CT-27SX11E/UE/CE

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
M011	TEK6940	DOOR CATCH
M012	TKP2AA0613S	ASSY, CONTROL DOOR
M013	TKX2AA0131	IR GUIDE
M014	TMW2A97121	STRAIN RELIEF: AC LINE CORD
M015	TXFKY31ESER	ASSY, CABINET FRONT
M016	TXFKU22ESER	ASSY, CABINET BACK CT-27SX11E/CE/UE
M017	TXFKU23ESER	ASSY, CABINET BACK CT-27SX31E/CE/UE
M018	TXFSPB03BSER	ASSY, SPEAKER BRACKET
JK3001	TJB2AA0221	TERMINAL, A/V 8P
JK3002	TJB2AA0171	TERMINAL, S-VHS
JK3003	TJB2AA0371	TERMINAL, FRONT A/V
JK3005	TJB2AA0211-1	TERMINAL, A/V 2P CT-27SX11E/CE/UE
JK3005	TJB2AA0341	TERMINAL, REAR A/V 3P CT-27SX31E/CE/UE

REF NO.	PART NO.	DESCRIPTION
ACCESORIES		
M019	UR51EC975A	BATTERY COVER, REMOTE CONTROL
M020	EUR511502	REMOTE CONTROL CT-27SX11E/CE/UE
M021	EUR511500	REMOTE CONTROL CT-27SX31E/CE/UE
M022	TQB2AA7078-1	V-CHIP NA8
M023	TQB2AA7060	REMOTE GUIDE CT-27SX31E/CE/UE
M024	TQB2AA7058	REMOTE GUIDE CT-27SX11E/CE/UE
M025	TQB2AA0372	MANUAL, OWNERS CT-27SX31E/UE & CT-27SX11E/UE
M026	TQB2AA0402	MANUAL, OWNERS CT-27SX31CE & CT-27SX11CE

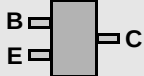


C-Board Voltages - Voltajes Placa-C

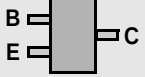
IC351	
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2	1.69
3	1.69
4	0.00
5	1.79
6	...219.68
7	...154.10
8	...153.40
9	...153.61

	Q369	Q951	Q952	Q953	Q954
B	14.80	2.39	1.10	7.08	6.39
C	0.00	8.80	7.09	8.80	0.00
E	14.59	1.70	0.50	7.10	7.10
	Q955	Q956	Q957	Q958	Q961
B	140.60	1.00	7.09	7.10	0.00
C	76.20	76.10	0.00	8.80	0.00
E	140.20	0.50	7.20	6.40	0.00
	Q962				
B	2.99				
C	8.80				
E	2.40				

IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN CHIP



CHIP TRANSISTOR LEAD DESIGNATION

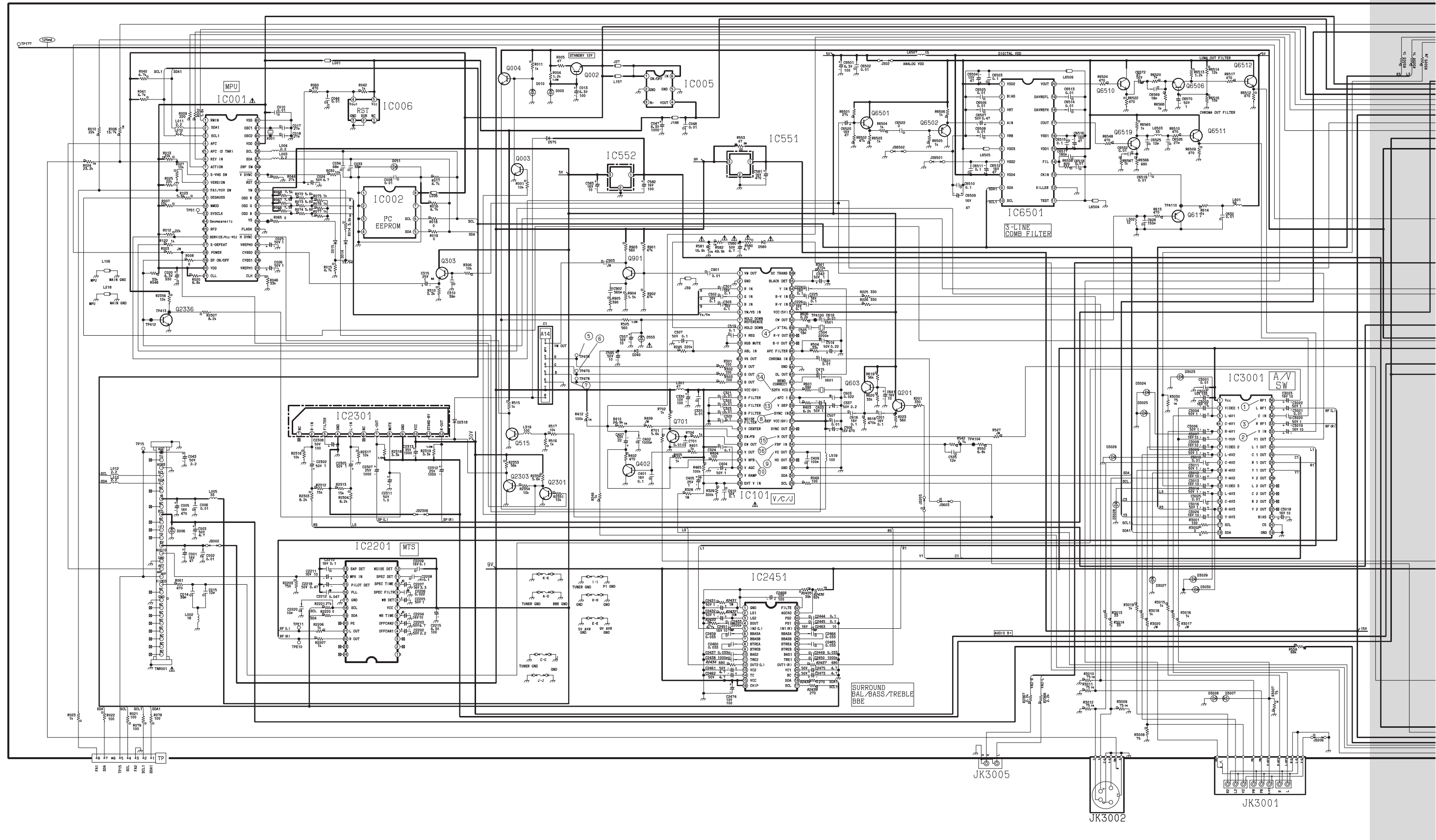


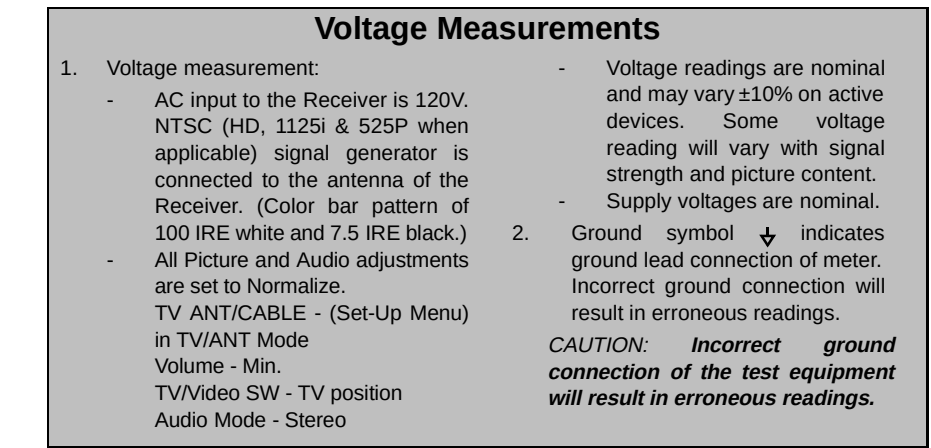
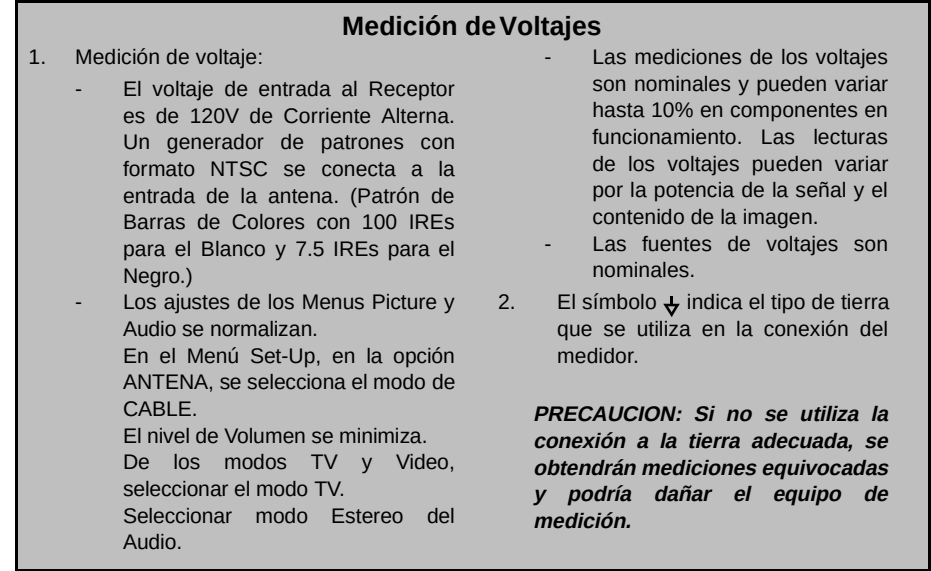
Schematic Notes

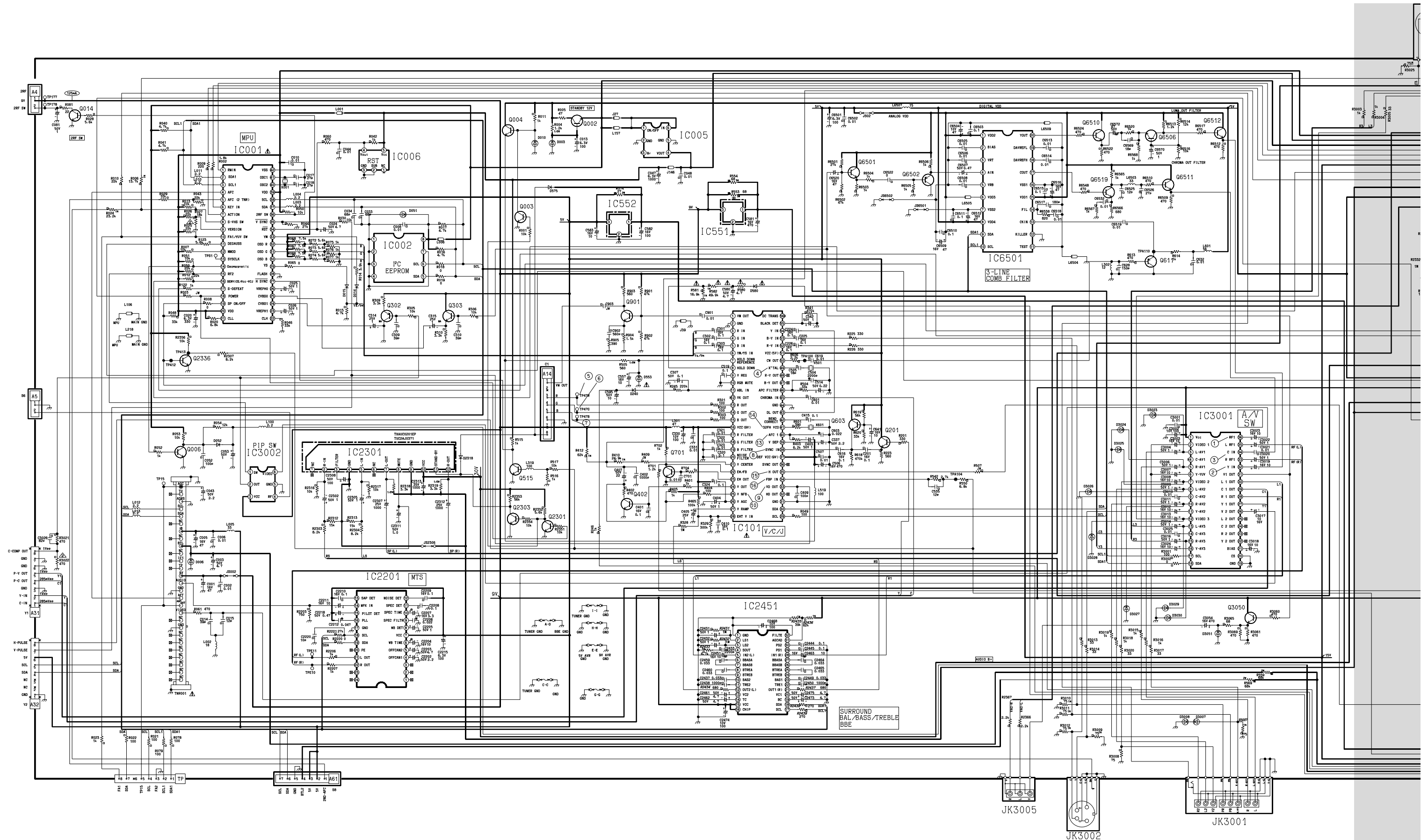
- Resistors are carbon 1/4W unless noted otherwise.
 - Capacitors are ceramic 50V unless noted otherwise.
 - Coil value notes is inductance in μH .
 - Test point indicated by $\uparrow$ Test point but no pin $\downarrow$.
 - Components indicated with Δ are critical parts and replacement should be made with manufacture specified replacement parts only.
 - (BOLD LINE) indicates the route of B+ supply.
 - The schematic diagrams are current at the time of printing and are subject to change without notice.
 - Ground symbol $\downarrow$ indicates HOT GROUND CONNECTION; $\uparrow$ indicates COLD GROUND.
- NOTE: All other component symbols are used for engineering design purposes.

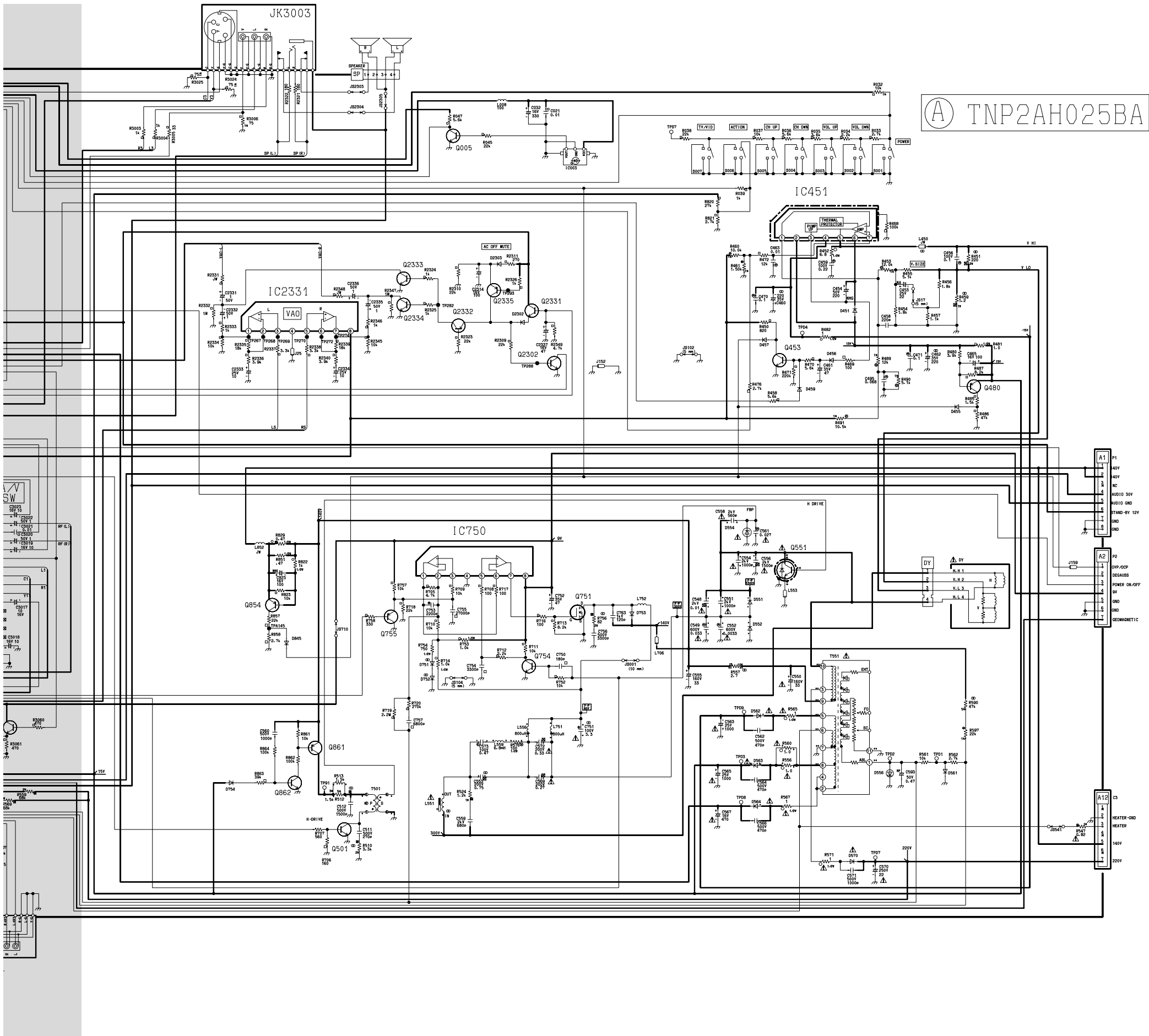
Notas de los Diagramas

- Las Resistencias son de Carbón de 1/4W, a menos que se indique otra característica.
 - Los Capacitores son de Cerámica para 50V, a menos que se indique otra característica.
 - El valor indicado de las Bobinas es la inductancia expresada en μH .
 - Los puntos de prueba en la terminal de algún componente son indicados por $\uparrow$ Los puntos de prueba fuera de los componentes se indican con $\downarrow$.
 - Los componentes señalados con el símbolo Δ son considerados componentes críticos y deben ser reemplazados sólo con las partes especificadas por el fabricante.
 - (LINEA GRUESA) indica las líneas de alimentación de los Voltajes B+.
 - Los diagramas eléctricos están sujetos a cambio sin previo aviso.
 - El símbolo $\downarrow$ indica que es una conexión a Tierra Caliente y el símbolo $\uparrow$ indica conexión a Tierra Fría.
- NOTA: Los demas símbolos de componentes incluidos son usados con fines de diseño.









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Medición de Voltajes

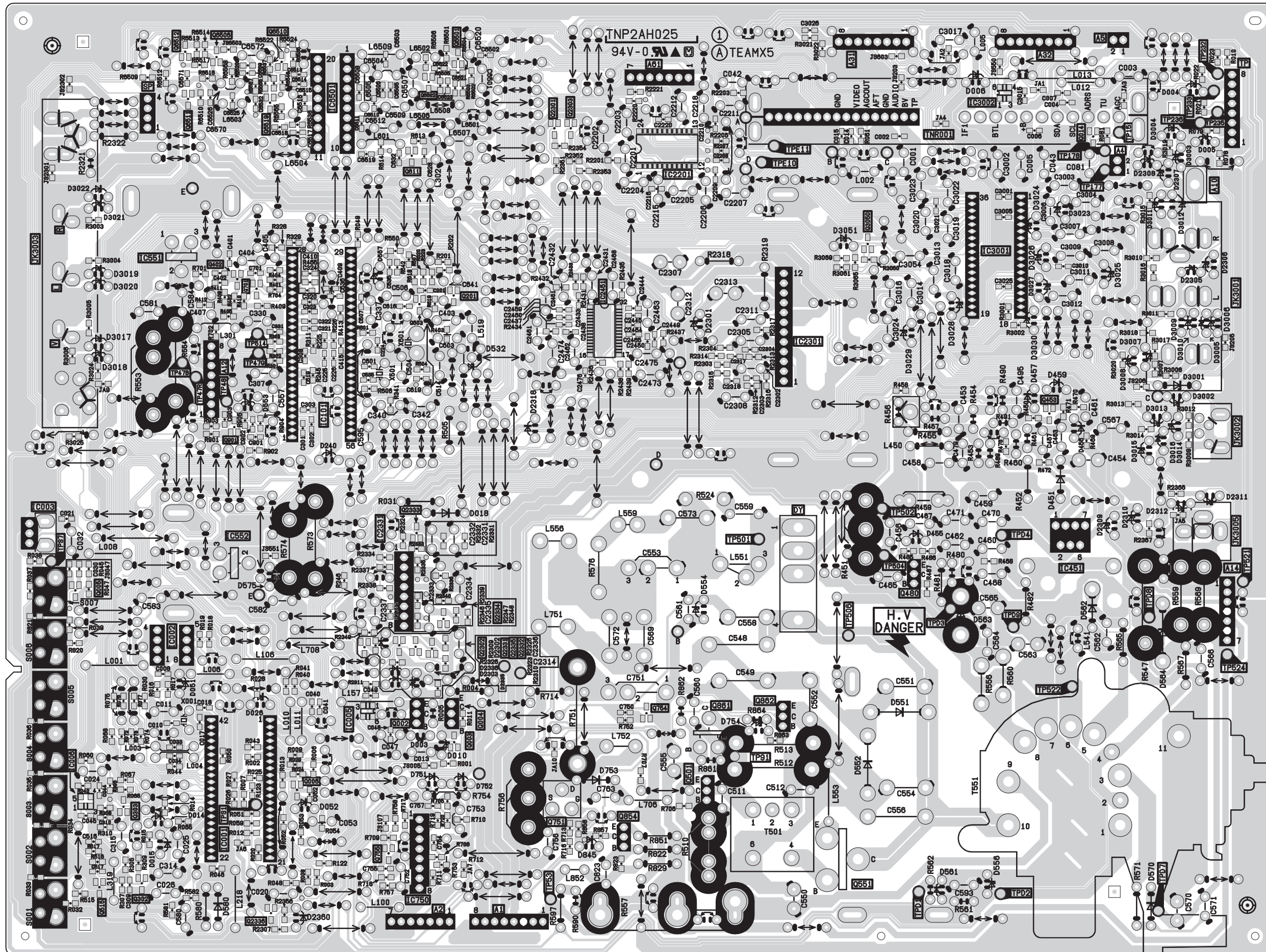
- Medición de voltaje:
 - El voltaje de entrada al Receptor es de 120V de Corriente Alterna. Un generador de patrones con formato NTSC se conecta a la entrada de la antena. (Patrón de Barras de Colores con 100 IREs para el Blanco y 7.5 IREs para el Negro.)
 - Los ajustes de los Menus Picture y Audio se normalizan. En el Menú Set-Up, en la opción ANTENA, se selecciona el modo de CABLE. El nivel de Volumen se minimiza. De los modos TV y Video, seleccionar el modo TV. Seleccionar modo Estereo del Audio.
 - Las mediciones de los voltajes son nominales y pueden variar hasta 10% en componentes en funcionamiento. Las lecturas de los voltajes pueden variar por la potencia de la señal y el contenido de la imagen.
 - Las fuentes de voltajes son nominales.
 - El símbolo  indica el tipo de tierra que se utiliza en la conexión del medidor.
- PRECAUCION:** Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

Voltage Measurements

- Voltage measurement:
 - AC input to the Receiver is 120V. NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.)
 - All Picture and Audio adjustments are set to Normalize. TV ANT/CABLE - (Set-Up Menu) in TV/ANT Mode Volume - Min. TV/Video SW - TV position Audio Mode - Stereo
 - Voltage readings are nominal and may vary $\pm 10\%$ on active devices. Some voltage reading will vary with signal strength and picture content.
 - Supply voltages are nominal.
 - Ground symbol  indicates ground lead connection of meter. Incorrect ground connection will result in erroneous readings.
- CAUTION:** *Incorrect ground connection of the test equipment will result in erroneous readings.*

NOTA DE SEGURIDAD

LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO .



IC001			
1	0.00	22	2.07
2	4.80	23	2.41
3	4.80	24	1.27
4	1.69	25	1.58
5	1.69	26	2.40
6	2.69	27	2.78
7	2.05	28	0.00
8	3.26	29	0.00
9	1.45	30	0.00
10	1.64	31	0.00
11	0.00	32	0.00
12	3.26	33	0.00
13	1.64	34	3.29
14	0.45	35	2.66
15	3.23	36	2.67
16	0.00	37	3.30
17	0.00	38	3.30
18	3.14	39	3.28
19	0.61	40	1.65
20	3.28	41	1.54
21	1.50	42	0.00

IC002	
1	 0.00
2	 0.00
3	 0.00
4	 0.00
5	 3.40
6	 3.40
7	 0.00
8	 4.98

IC003	
1	2.75
2	0.00
3	4.98

IC006	
1	 0.00
2	 0.00
3	 0.00
4	 3.29
5	 3.29

IC005	
1	4.98
2	0.00
3	1.48
4	3.29
5	0.00
6	4.98

IC2331	
1	4.37
2	4.37
3	4.37
4	0.00
5	4.37
6	4.37
7	4.37
8	4.77

IC101			
1	4.00	29	3.33
2	0.00	30	3.34
3	3.28	31	0.00
4	3.28	32	0.00
5	3.28	33	3.83
6	0.00	34	1.11
7	6.01	35	1.81
8	5.16	36	0.00
9	5.19	37	8.95
10	0.00	38	3.12
11	5.57	39	6.15
12	4.48	40	7.49
13	2.64	41	5.88
14	2.67	42	4.88
15	2.67	43	1.12
16	8.54	44	0.00
17	5.10	45	1.74
18	5.03	46	1.58
19	5.01	47	2.23
20	2.54	48	2.24
21	3.96	49	3.86
22	4.50	50	3.35
23	0.65	51	4.89
24	0.64	52	2.94
25	5.22	53	2.98
26	2.06	54	3.75
27	4.33	55	2.91
28	4.92	56	3.20

IC2201	
1	0.00
2	0.00
3	0.00
4	2.22
5	2.20
6	0.30
7	4.86
8	2.40
9	2.35
10	0.47
11	2.20
12	2.97

IC2301	
1	 0.00
2	 0.00
3	30.69
4	 0.00
5	 0.00
6	 0.00
7	15.54
8	 0.64
9	 0.00
10	31.98
11	12.03
12	15.33

IC3001			
1	8.71	19	0.00
2	3.60	20	0.00
3	4.48	21	3.98
4	4.48	22	3.21
5	4.48	23	3.80
6	3.67	24	3.83
7	3.91	25	3.81
8	4.48	26	3.26
9	4.49	27	3.21
10	4.48	28	3.81
11	3.70	29	3.83
12	3.94	30	3.81
13	4.48	31	3.71
14	4.48	32	4.23
15	4.48	33	4.48
16	4.31	34	4.49
17	4.80	35	4.48
18	4.79	36	4.58

IC3002	
1	3.23
2	3.60
3	8.70
4	3.30
5	0.00
6	3.29

IC451	
1	1.33
2	15.65
3	-13.03
4	-15.69
5	0.21
6	16.22
7	1.33

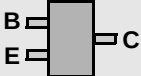
IC551	
1	15.84
2	0.00
3	8.79

IC552	
1	8.04
2	0.00
3	4.90

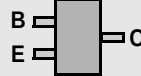
IC750	
1	8.75
2	6.49
3	3.01
4	4.61
5	0.00
6	5.05
7	5.04
8	3.00

	Q002	Q003	Q004	Q005	Q006
B	5.66	0.00	9.27	0.62	0.00
C	8.22	9.28	14.03	0.00	2.51
E	4.99	0.00	9.02	0.00	0.00
	Q014	Q201	Q2301	Q2302	Q2303
B	0.74	1.69	0.67	0.00	0.00
C	0.12	4.88	0.00	0.32	12.05
E	0.00	1.04	0.00	0.00	0.00
	Q2331	Q2332	Q2333	Q2334	Q2335
B	0.00	0.00	-0.49	0.00	14.02
C	14.23	-0.57	0.00	0.00	0.00
E	0.49	0.00	0.00	0.00	13.29
	Q2336	Q302	Q303	Q3050	Q402
B	0.61	3.55	3.66	3.70	0.63
C	0.00	4.91	4.91	8.69	3.66
E	0.00	2.92	3.03	2.98	0.00
	Q453	Q480	Q501	Q515	Q551
B	0.72	15.72	0.28	0.00	0.00
C	0.00	0.00	107.5	2.78	12.68
E	0.00	15.93	0.00	0.00	0.00
	Q603	Q611	Q6501	Q6502	Q6506
B	1.02	0.00	2.84	1.11	0.00
C	4.88	0.00	4.87	0.00	1.69
E	1.02	0.69	2.18	1.78	0.00
	Q6510	Q6511	Q6512	Q6519	Q701
B	2.33	2.24	1.69	2.43	0.63
C	4.87	4.87	4.87	2.25	4.50
E	1.70	1.58	1.04	1.78	0.00
	Q751	Q754	Q755	Q854	Q901
B	0.00	0.00	4.50	141.69	3.36
C	28.68	4.58	0.00	12.4	2.98
E	6.39	0.00	0.00	142.3	2.69

IDENTIFICACIÓN DE TERMINALES
PARA TRANSISTORES EN CHIP



CHIP TRANSISTOR
LEAD DESIGNATION



Nota:

La medición de los voltajes se hizo con un Voltímetro Digital.

Note:

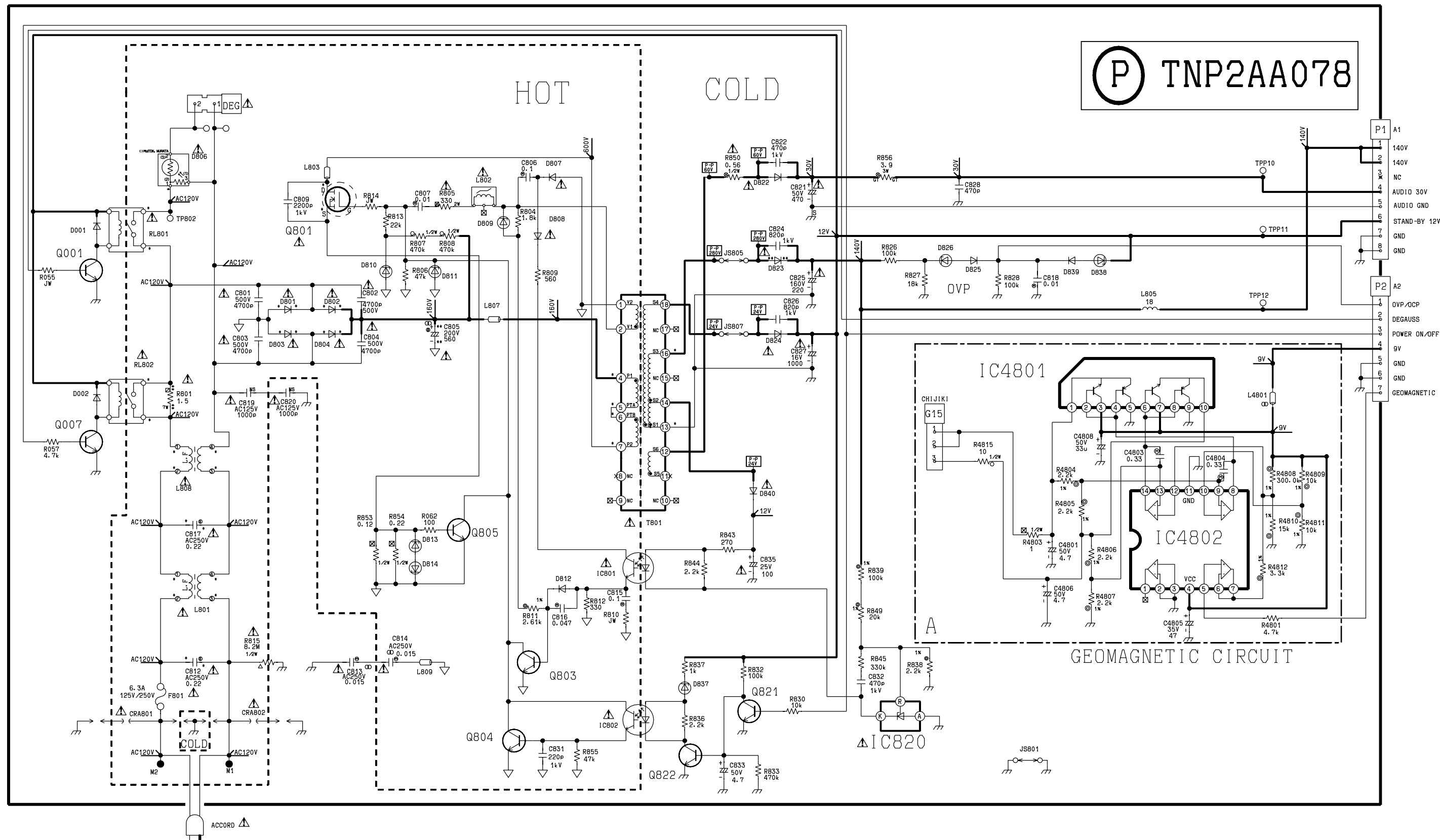
Obtained voltages with a digital multimeter.

Medición de Formas de Onda

- Un símbolo como ③ indica el punto para medir una señal. (La medición puede hacerse en el punto con mayor accesibilidad, siempre que sea común al indicado.)
 - Se midieron utilizando un generador con formato NTSC conectado a la terminal de la antena. (Patrón de 8 Barras de Colores EAI, formato NTSC de 100 IRES para el Blanco y 7.5 IRES para el Negro.)
 - Los ajustes de usuario de los Menus PICTURE y AUDIO se normalizaron. Posteriormente el nivel de volumen se ajusta al mínimo.
 - Las formas de onda de Video y Color fueron tomadas con un osciloscopio de banda alta y con una punta de prueba de baja capacitancia (10 a 1). La forma y amplitud de las ondas puede variar según el tipo de osciloscopio que se utilice y sus características.
 - El símbolo de tierra ⚡ que aparece junto al número de la forma de onda, indica que se utiliza conexión a **Tierra Caliente** en el extremo negativo de la punta de prueba.
- PRECAUCION:** Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

Medición de Voltajes

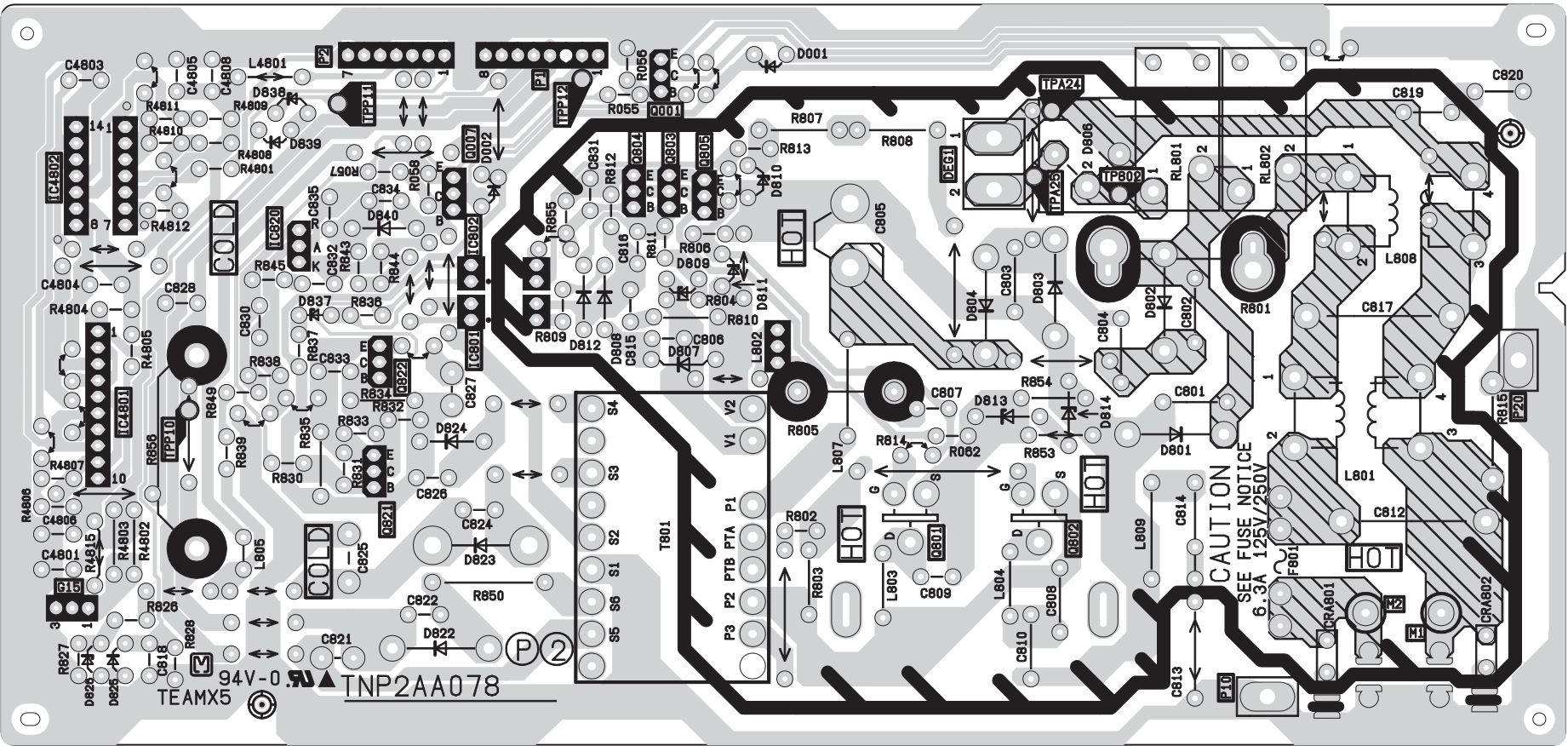
- Medición de voltaje:
 - El voltaje de entrada al Receptor es de 120V de Corriente Alterna. Un generador de patrones con formato NTSC se conecta a la entrada de la antena. (Patrón de Barras de Colores con 100 IRES para el Blanco y 7.5 IRES para el Negro.)
 - Los ajustes de los Menus Picture y Audio se normalizan. En el Menú Set-Up, en la opción ANTENA, se selecciona el modo de CABLE. El nivel de Volumen se minimiza. De los modos TV y Video, seleccionar el modo TV. Seleccionar modo Estereo del Audio.
 - El símbolo ⚡ indica el tipo de tierra que se utiliza en la conexión del medidor.
- PRECAUCION:** Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.



IC4801		IC4802	
1	1.29	1	0.00
2	0.65	2	0.00
3	8.75	3	0.00
4	0.65	4	8.76
5	0.00	5	3.04
6	5.56	6	3.03
7	8.75	7	3.03
8	5.56	8	0.65
9	0.00	9	3.72
10	4.94	10	3.67
IC802		IC820	
1	11.37	1	14.29
2	0.00	2	0.00
3	0.00	3	2.38
4	11.37		
IC801			
1	15.34		
2	0.00		
3	0.00		
4	14.31		

	Q001	Q007	Q801	Q803	Q804
B	0.12	0.63	0.00	0.00	0.00
C	-31.25	5.41	-32.41	4.39	4.47
E	4.48	0.00	4.51	0.00	0.00

	Q805	Q821	Q822
B	0.00	0.51	0.00
C	4.49	0.00	11.36
E	0.00	0.00	0.00



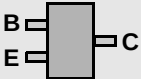
Nota:

La medición de los voltajes se hizo con un Voltímetro Digital.

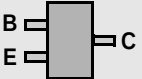
Note:

Obtained voltages with a digital multimeter.

IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN CHIP



CHIP TRANSISTOR LEAD DESIGNATION

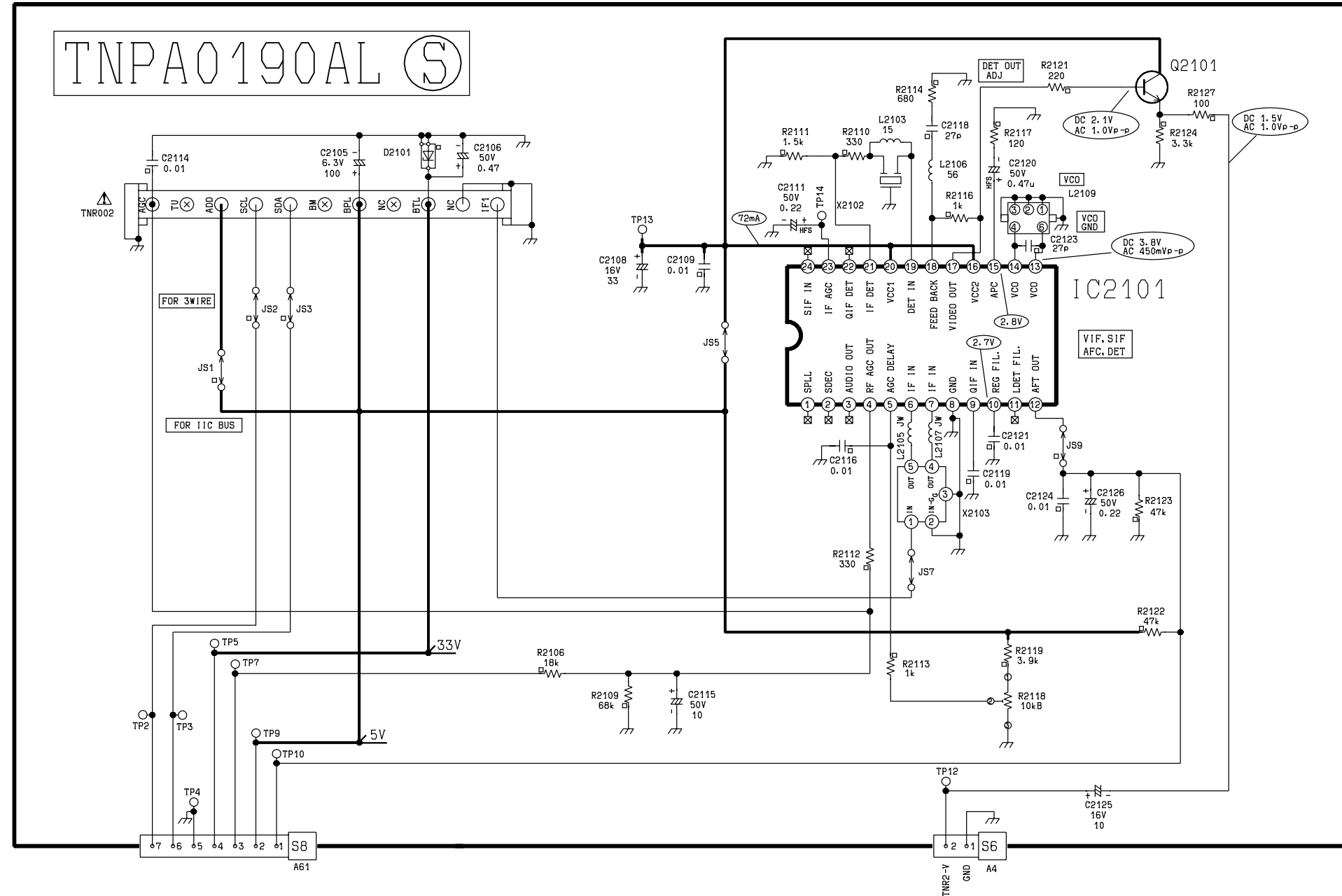


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NOTA DE SEGURIDAD

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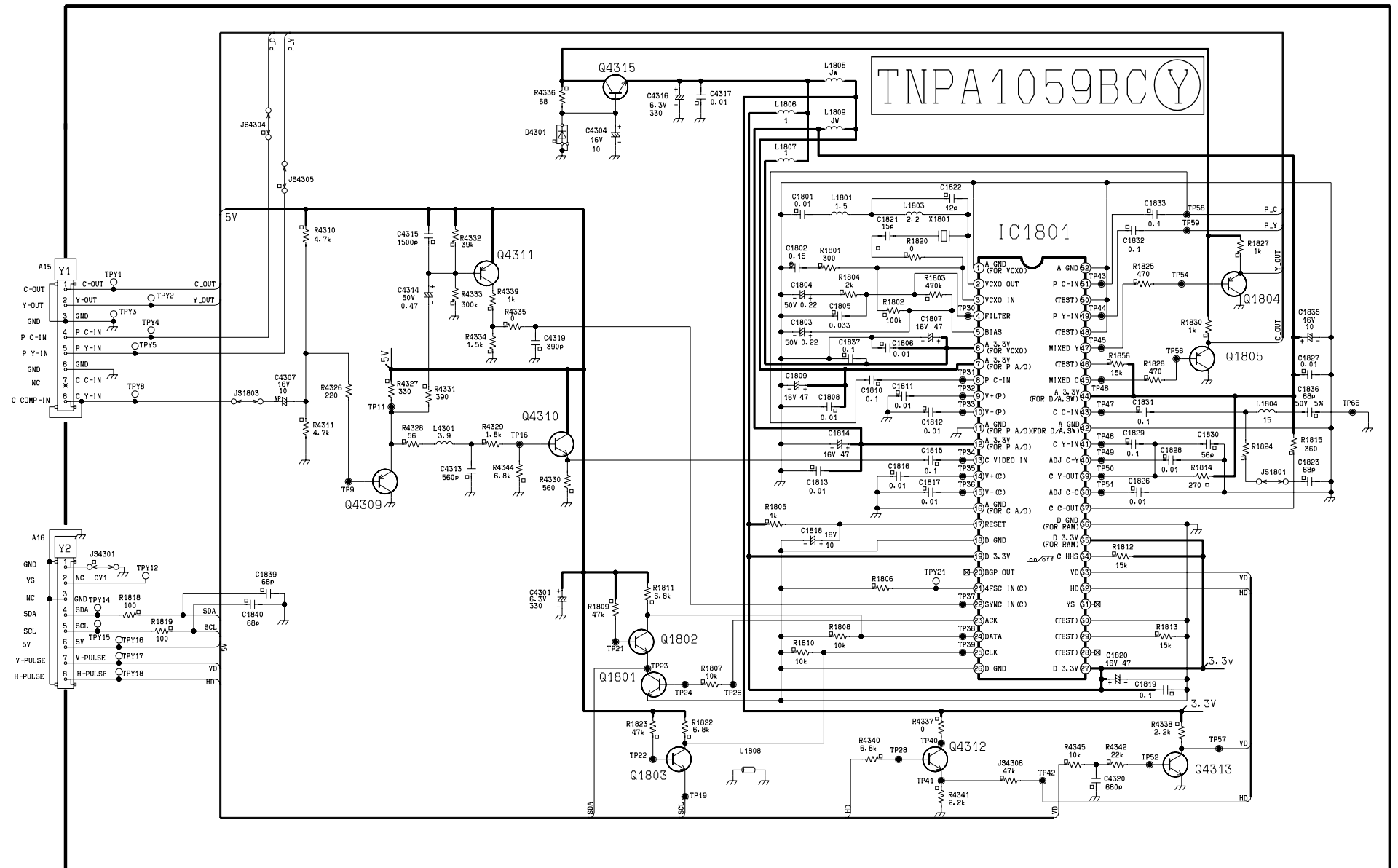


	Q2101
B	2.09
C	4.86
E	1.56

A diagram of a 2-to-1 multiplexer. It consists of a central gray rectangular block. On the left side, there are two input lines labeled 'B' (top) and 'E' (bottom). On the right side, there is a single output line labeled 'C'.

A logic block with two inputs, B and E, and one output, C.

1. Voltage measurement: - AC input to the Receiver is 120V. NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.) - All Picture and Audio adjustments are set to Normalize. TV ANT/CABLE - (Set-Up Menu) in TV/ANT Mode Volume - Min. TV/Video SW - TV position Audio Mode - Stereo	- Voltage readings are nominal and may vary $\pm 10\%$ on active devices. Some voltage reading will vary with signal strength and picture content. - Supply voltages are nominal. 2. Ground symbol indicates ground lead connection of meter. Incorrect ground connection will result in erroneous readings. CAUTION: <i>Incorrect ground connection of the test equipment will result in erroneous readings.</i>
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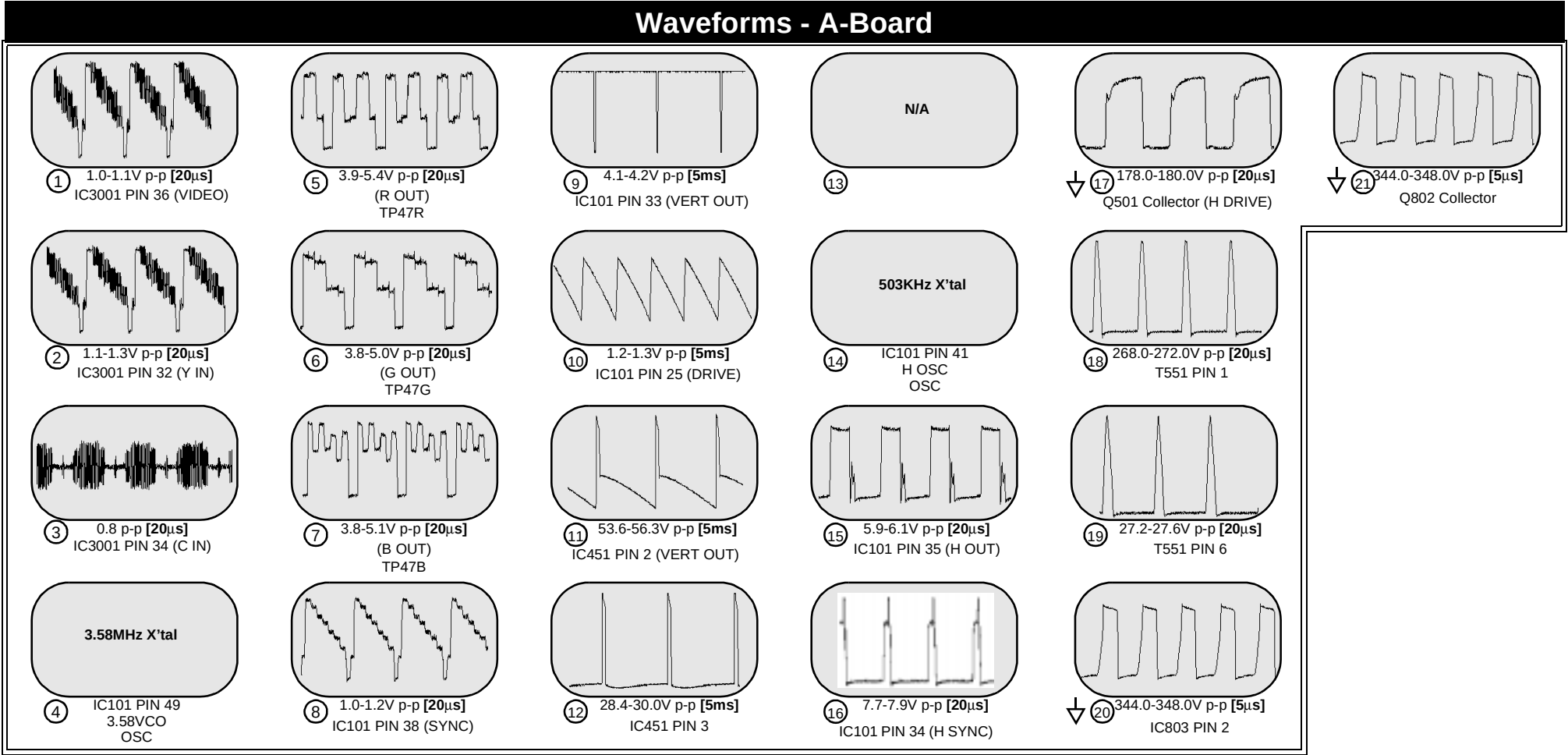


IC1801					
1		0.00	27		3.24
2		1.39	28		3.24
3		1.59	29		0.00
4		1.52	30		0.00
5		1.60	31		0.00
6		3.25	32		0.60
7		3.25	33		0.14
8	.....	0.98	34	.....	3.21
9	.....	1.49	35	.....	3.24
10	.....	1.49	36	.....	0.00
11	.....	0.00	37	.....	2.84
12	.....	3.24	38	.....	1.20
13	.....	0.98	39	.....	2.83
14	.....	1.49	40	.....	1.33
15	.....	0.46	41	.....	1.03
16	.....	0.00	42	.....	0.00
17	.....	3.24	43	.....	1.00
18	.....	0.00	44	.....	3.25
19	.....	3.24	45	.....	0.99
20	.....	0.00	46	.....	3.22
21	.....	0.00	47	.....	1.01
22	.....	0.20	48	.....	0.00
23	.....	0.00	49	.....	1.01
24	.....	2.44	50	.....	0.00
25	.....	2.46	51	.....	0.99
26	.....	0.00	52	.....	0.00

	Q1801	Q1802	Q1803	Q1804	Q1805
B	0.00	3.00	3.10	1.01	1.00
C	3.40	2.30	2.50	0.00	0.00
E	0.00	3.47	3.48	1.09	1.67
	Q4309	Q4310	Q4311	Q4312	Q4313
B	2.43	2.44	4.58	0.25	0.64
C	0.00	4.78	0.32	3.25	0.14
E	3.13	1.78	4.72	0.56	0.00
	Q4315				
B	0.00				
C	3.95				
E	0.00				

A diagram of a 2-to-1 multiplexer. It consists of a central gray rectangle. On the left side, there are two input lines labeled 'B' and 'E'. On the right side, there is one output line labeled 'C'.

A diagram of a black box with two inputs on the left and one output on the right. The inputs are labeled B and E, and the output is labeled C.



Waveform Measurements

- ③ indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
- Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
- Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to "MIN".
- All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
- Ground symbol ⚡ shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.

CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

Medición de Formas de Onda

- Un símbolo como ③ indica el punto para medir una señal. (La medición puede hacerse en el punto con mayor accesibilidad, siempre que sea común al indicado.)
- Se midieron utilizando un generador con formato NTSC conectado a la terminal de la antena. (Patrón de 8 Barras de Colores EAI, formato NTSC de 100 IREs para el Blanco y 7.5 IREs para el Negro.)
- Los ajustes de usuario de los Menus PICTURE y AUDIO se normalizaron. Posteriormente el nivel de volumen se ajusta al mínimo.
- Las formas de onda de Video y Color fueron tomadas con un osciloscopio de banda alta y con un punta de prueba de baja capacitancia (10 a 1). La forma y amplitud de las ondas puede variar según el tipo de osciloscopio que se utilice y sus características.
- El símbolo de tierra ⚡ que aparece junto al número de la forma de onda, indica que se utiliza conexión a **Tierra Caliente** en el extremo negativo de la punta de prueba.

PRECAUCION: Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

NOTA DE SEGURIDAD

LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO ⚡.

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PARTS LIST ABBREVIATIONS GUIDE

RESISTOR			
TYPE		TOLERANCE	
C	Carbon	F	± 1%
F	Fuse	J	± 5%
M	Metal Oxide	K	± 10%
S	Solid	M	± 20%
W	Wire Wound	G	± 2%

RES, C 270-J-1/4

CAPACITOR			
TYPE		TOLERANCE	
C	Ceramic	C	± 0.25pF
E	Electrolytic	D	± 0.5pF
P	Polyester	F	± 1pF
S	Styrol	J	± 5%
T	Tantalum	K	± 10%
		L	± 15%
		M	± 20%
		P	+10% -0%
		Z	+80% -20%

CAP, P .068UF-K-50V

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